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THE AMERICAN GAS LIGHT JOURNAL INC.

VOL. CI., No. 26. NEW YORK, DECEMBER 28, 1914. WHOLE No. 2,064.

THE INDUSTRY OF THE COAL-TAR DYES—AN OUTLINE SKETCH.[1]

By BERNHARD C. HESSE,

At the very beginning it should be pointed out that the world's market in coal-tar dyes to-day comprises, in round numbers, 900 distinct chemical substances made, by the aid of 300 products of transformation, themselves not dyes, of 9 products obtained from coal-tar by distillation, refrigeration, expression or the like. Therefore the present coal-tar industry comprises no fewer than 1,200 different products and as many more different processes.

In the production of tar, suitable for use in the coal-tar dye industry, there is made on the average from 100 parts of coal:

72 parts Coke, 6 parts Tar (liquid and solid distillate), 22 parts Gas.

The distillate, amounting to 6 per cent. of the weight of the coal, is the product with which we are here concerned.

Chemists have ascertained the presence of 155 distinct chemical substances in tar, classified broadly as follows:

Series.	No.	Series	No.
Marsh gas	45	Anthracene	5
Benzol	75	Phenanthrene	5
Napthalene	14	Miscellaneous	13

For dyestuff production the first is negligible and the last almost so. The chemical elements entering into the composition of the above substances are 5 only:

Carbon, Hydrogen, Oxygen, Nitrogen, Sulphur.

According to the combinations of these elements, we have the 5 following classes of compounds:

Carbon and hydrogen	76
Carbon, hydrogen and nitrogen	37
Carbon, hydrogen and oxygen	23
Carbon, hydrogen and sulphur	3
Carbon, hydrogen, nitrogen and sulphur	3

Rearranging these under the 3 relevent general series we have:

	Benzol.	Naphthalene.	Anthracene.	Total.
Carbon and hydrogen	25	6	3	34
Carbon, hydrogen and nitrogen	23	..	2	34
Carbon, hydrogen and oxygen	11	8	..	19
Carbon, hydrogen and sulphur	3	..	..	3
Carbon, hydrogen, nitrogen and sulphur	2	..	..	2
Total	73	14	5	92

1 From address before the Board of Directors of the General Chemical Company, in "Journal of Industrial and Engineering Chemistry.

Out of these 92 compounds the coal-tar dye industry uses only 9, namely:

Benzol	Phenol	Methyl anthrecene
Toluol	Napthalene	Phenanthrene
Xylol	Anthracene	Carbazol

These 9 make up about from 6 to 12 per cent. of the tar, or from 0.38 to 0.75 per cent. of the coal, divided approximately as shown in the following chart:

	On Tar.	On Coal.
Benzol, toluol, etc	1.75	0.105
Phenol	0.25	0.015
Napthalene	5.95	0.375
Anthracene, etc	0.20	0.012

The entire coal-tar dye industry is based upon these 9 coal-tar compounds, or crudes; the 9 crudes are converted into about 300 intermediates, themselves not dyes, and the 300 intermediates into 900 and more dyes.

For 1913 the total export value of Germany's coal-tar industry, including dyes and products of chemical transformation of the 9 crudes, amounted to $55,264,522, distributed to 33 countries, and shared in by 22 factories. Twenty-one of these factories had a combined capitalization of $36,700,000 and paid dividends of $11,600,000, or 21.74 per cent.

The United States produced in 1912 (mostly from imported intermediate products) coal-tar dyes of a value of $3,750,000; and imported dyes costing about $12.000,000.

Germany in the same year manufactured coal-tar dyes and intermediates worth $68,222,846; and exported of them more than $55,000,000.

The large items of these 900 dyes, as nearly as can be ascertained from official sources of export, are:

	Value.	Per cent. of total.	Per cent. of total exports to U. S.
Indigo	$12,690,874	23.01	10.38
Alizarin	2,219,588	3.99	8.05
Anilin oil	1,408,722	2.54	33.42
Anthracene dyes	2,914,786	5.22	44.08
Anilin dyes	33,814,802	66.24	21.56
Anthracene and benzol compounds not dyes	1,492,736	2.72	16.22
Naphthalene compounds not dyes	723,040	1.27	20.53

The World's Production of Coal Tar Dyes.—In 1896 the world's *analin* (only a part of the coal-tar dyes) dye production was estimated at $25,000,000, divided as follows:

		Per cent.
Germany	$18,000,000	72
Switzerland	3,200,000	12.8
France	1,600,000 to 2,000,000	8.0
Great Britain	1,600,000 to 1,800,000	7.2

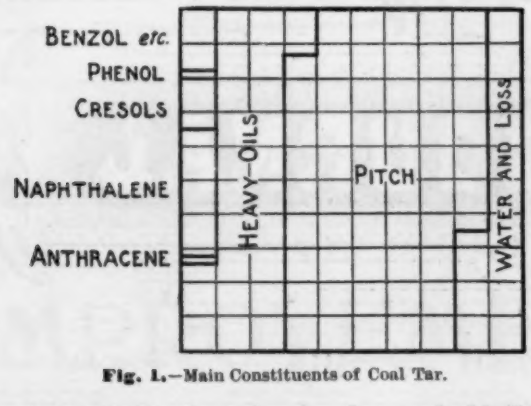


Fig. 1.—Main Constituents of Coal Tar.

This is *exclusive* of alizarin, anthracene dyes, and of indigo.

For 1912, value figures are available only for Germany, Switzerland, and Great Britain; tonnage figures for Austria. They show the following trade balance in *all* branches: crudes, intermediates, and finished dyes, including analin dyes, alizarin, anthracenes dyes, and indigo.

Final Balances, 1912.	Imports.	Exports.
Germany	.....	$51,545,326
Switerland	.....	3,794,898
Great Britain	$6,275,775	.....

The average German import and export values of crudes, intermediate and finished dyes in 1913 was as follows:

	Imports.		Exports	
	Cents per lb.	On basis of crudes.	Cents per lb.	On basis of crudes.
Crudes	2.06	1.00	2.83	1.00
Intermediates	12.08	5.85	10.07	3.56
Finished dyes	23.57	11.42	21.53	7.61

These average figures, unfortunately, give no direct indication of the true enhancement of crudes to intermediates, to finished dyes. While the crudes are as a rule of quite uniform percentage purity, the intermediates and the finished dyes are not; some of the intermediates contain only 60 per cent. of the theoretical of the corresponding crudes, some of the finished dyes, *e. g.*, indigo, being in the form of 20 per cent. pastes with water. As a matter of calculation, making no allowance for losses, etc., 889 pounds of naphthalene make 1,000 pounds of naphthol or of naphthylamine, and 839 pounds benzol make 1,000 pounds of anilin oil.

The following is the *estimated* distribution of total production of of coal-tar dyes for 1912:

Germany	$68,222,846
Great Britain	5,982,675
Switzerland	6,452,651
France	5,000,000
United States	3,750,000

with Russia, Holland, Austria and Belgium to be added. Allowing $10,000,000 for these, which is clearly very high, makes the absolute maximum production all over the world substantially $100,000,000. The combined actual factory or works area of the world's coal-tar dye plants probably does not exceed one square mile.

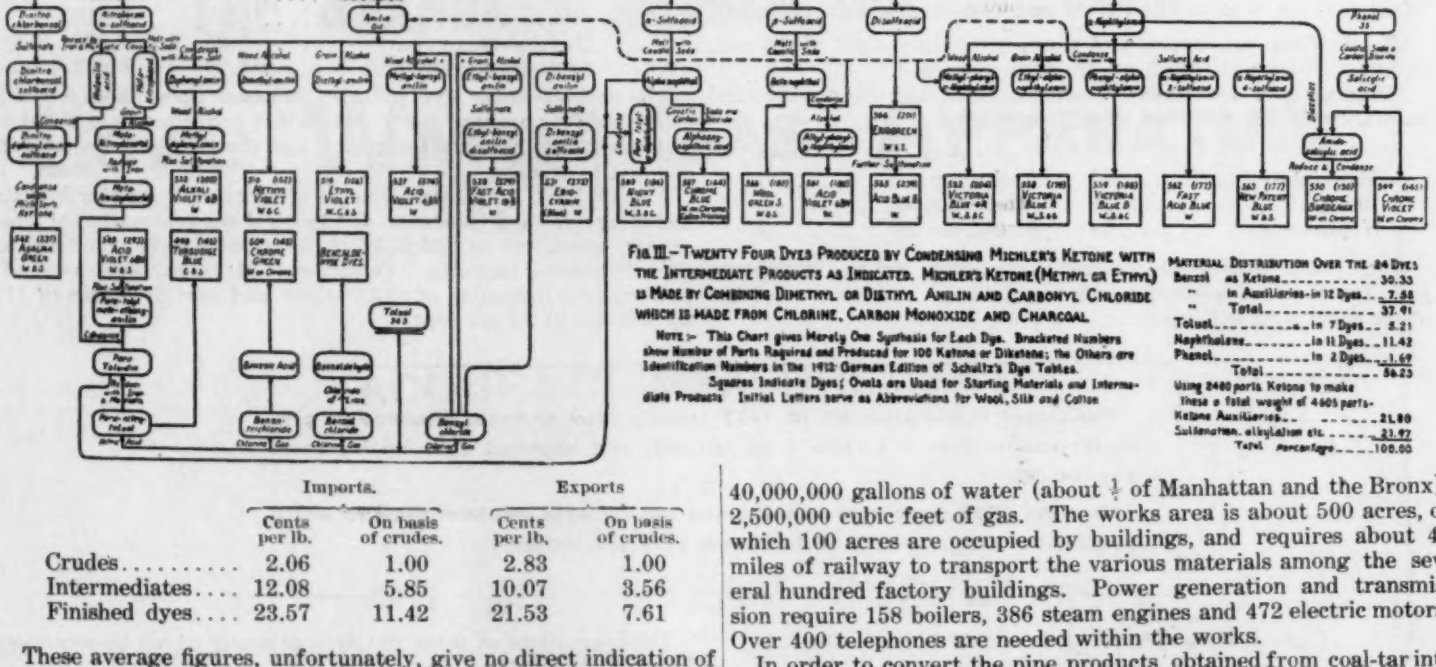
It has been urged that Germany is not wholly independent of outsiders for its coal-tar materials. The 3.79 per cent. of imports to exports may support that view.

In 1908 the average wage paid in Germany in this industry was about 4.80 marks per day inclusive of boys, common labor and skilled labor. With about 24 boys out of every 100 persons employed, and assuming a boy receives ¼ a man's pay, this makes the average man's wage M. 5.85 or $1.40. The $750,000 annual welfare expense is 44 cents additional or $1.84 average daily adult wage. To this should be added the bonuses given to many of the workmen and also the works' contribution to the State old age pension and sick fund. Consequentiy, the average adult daily wage is about $1.84.

In Germany the day is a 2-shift day with 2 hours and 20 minutes taken out for meals and rest and for about one-third the men an additional 30 minutes for washing up; so that one-third work 12 hours less 2 hours and 50 minutes, and two-thirds work 12 hours less 2 hours and 20 minutes, or an average day of 9½ hours net actual average working time for which they receive at least 10 hours pay, and it may be 12 hours pay. In the United States the day is a 3-shift day.

Labor participates to a small extent only in the final cost of the finished dye, never exceeding 15 and is, as a rule, more nearly 10 per cent.

A Typical Factory.—A German coal-tar dye works of considerable size will have a daily use for 1,000 tons of coal, 40 tons ice,


Michler's Ketone
Zinc-Ammonium Chloride
Sulfuric Acid
Nitric Acid
Nitronaphthalene
Naphthalene
Chlorbenzol
Nitrobenzol
Aniline Oil
Phenol
Salicylic acid
Acetic anhydride
Acetic acid
Condenser
Alkali
Sulfonate
Caustic Soda
Alcohol
Sulfuric Acid
Aniline Oil
Methyl Aniline
Ethyl Aniline
Benzyl Chloride
Dimethyl Aniline
Diethyl Aniline
Benzoic Acid
Benzotrichloride
Benzoyl chloride
Phosgene
Dimethyl Aniline
Diethyl Aniline
Methyl-benzyl aniline
Ethyl-benzyl aniline
Dibenzyl aniline
Ethyl-benzyl aniline sulfonate
Dibenzyl aniline sulfonate
Methyl-ethyl-benzyl aniline
Methyl-dibenzyl aniline
Ethyl-dibenzyl aniline
Para-tolyl-methyl-ethyl-aniline
Para-tolyl-dibenzyl aniline
Para-tolyl-ethyl-benzyl aniline
Para-tolyl-dibenzyl aniline
Para Toluidine
Para-tolyl-phenyl-glycine
Para-tolyl-benzyl-glycine
Para-tolyl-glycine
Tolanol 303
Benzo-trichloride
Benzoyl chloride
Benzoyl chloride
Naphthalene 478
Sulfuric Acid
Nitric Acid
Naphthalene sulfonic acid
Nitro-naphthalene
Michler's Ketone
Zinc-Ammonium Chloride
Aniline Oil
Phenol 35
Salicylic acid
Anodic anthracic acid
Anthracene A
Condenser
Naphthol
Naphthylamine
Alpha-naphthol
Alpha-naphthol sulfonic acid
Alpha-naphthylamine
Alpha-naphthylamine sulfonic acid
Beta-naphthol
Beta-naphthol sulfonic acid
Beta-naphthylamine
Beta-naphthylamine sulfonic acid
Caustic Soda
Alcohol
Condenser
Sulfuric Acid
Methyl-phenyl-alpha-naphthylamine
Ethyl-phenyl-alpha-naphthylamine
Methyl-ethyl-alpha-naphthylamine
Methyl-phenyl-beta-naphthylamine
Ethyl-phenyl-beta-naphthylamine
Methyl-ethyl-beta-naphthylamine
Dimethyl-alpha-naphthylamine
Diethyl-alpha-naphthylamine
Dimethyl-beta-naphthylamine
Diethyl-beta-naphthylamine
Alpha-naphthylamine sulfonic acid
Beta-naphthylamine sulfonic acid
Alpha-naphthol sulfonic acid
Alpha-naphthol
Alpha-naphthylamine
Beta-naphthol
Beta-naphthylamine
Endorein W 4 L
Further Condensation
Condenser
Sulfuric Acid
Alcohol

the 900 dyes exhaust those theoretically possible. There are many thousands of dyestuffs wholly distinct from each other embraced in the 8,000 German patents; but of these only 400 individuals have survived and are of use. It is safe to say that the German coal-tar dye industry has gone over all of the known fields in fine-tooth-comb fashion. They are, of course, searching for new fields; in the last 10 years only one new field has been opened and while that is limited it promises to be of great value.

Therefore, a research laboratory, in the narrow sense of the word, is not necessary for the development of a real coal-tar dye industry in the United States. What we *do* need is a semi-manufacturing laboratory to ascertain the most favorable conditions for carrying out those operations which have been shown to be needful or worthy of prosecution. That, however, is no small task; it calls for engineering skill of the highest order, for chemical knowledge of great refinement and experimental ability of high rank. Much will have to be determined as to the proper materials of construction, the proper size and shape of the apparatus and the most favorable working unit; which are by no means constant from one product to another. Many dyestuffs cannot be made commercially in lots greater than 110 pounds; others can be made in lots of one ton, but the manufacturing unit, as a rule, is small. Much of the apparatus is enamelled or lead-lined. Of caurse, the ultimate success will depend upon our ability to merchandize against the very efficient organization of the Germans.

Practically all of the works keep the details of their actual processes very much to themselves. Thus, for example, one works may excel in the production of sulphonated anilin-blues; while there is nothing patentable about that operation, the trade will take one factory's product in preference to any other, on looks alone. There are numerous instances where even the large works with all their research facilities and engineering ability have been unable to outflank an original patentee or producer. In one instance, at least, Americans produce a dye from German intermediates and sell the dye to Germans. We must, therefore, be prepared to expect that our goods would not sell in open competition with foreign makes of the same goods for perhaps one or more years after we attempt to market them.

Furthermore, because of the necessity of having careful, uniform manufacture at *all* points, it is impossible for any one chemist to acquire valuable manufacturing experience in more than a very limited number of transformations. Therefore, purchase of recipes or engagement of competent chemists to make whole lines of dyes is practically out of the question. We shall have to rely on our own ingenuity, skill and ability to devise successful commercial methods of manufacture.

In 1897 the total number of different brands or commercial varieties of dyes sold by a single German concern all over the world amounted in round numbers to 8,000. Each one of these 8,000 has its peculiar advantage over each of the others. This necessitates the production of sample cards by the dye makers each season to show how the fashionable shades and staple shades can be made.

The entire industry is a maze of interlocking products and by-products; great in number but, in most cases, small in volume individually. In numerous instances the existence of the by-products was the sole directing cause for the invention of new dyes and classes of dyes.

The 921 dyes on the market in 1912 are divided into 17 separate chemical classes as follows:

Nitroso dyes	4
Nitro dyes	4
Stilbene dyes	10
Pyrazolone dyes	12
Azo dyes	462
Auramines	2
Tri- and di-phenylmethane dyes	73
Yanthone dyes	34
Acridin dyes	8
Chinolin dyes	4
Thiobenzenyl dyes	5
Indophenol dyes	1
Oxazin and thiazin dyes	48
Azin dyes	38
Sulfide dyes	52
Anthraquinone and allied dyes	116
Indigo dyes	48
Total	921

For purposes of illustration, diagrams have been constructed to show in the simplest manner the genetic relationships between crudes, intermediates and finished dyes but they are *not* to be taken as expressing all details or all possible modes or even the best way of making the various products. They show the order of production of the principal transformations and indicate briefly *one* way of accomplishing that change; they are indicative only, and must not be regarded as presenting actual manufacturing operations.

The Ketone Dyes (Fig. HI.).—This synthesis has been selected to illustrate a group of twenty-four dyes closely related chemically that are good sellers and have been on the market for upwards of 30 years with the exception of one or two which are only 8 or 10 years old. Eight were never patented in the United States; on 11 the U. S. patents have expired: on 3 the U. S. patents expire in 1915; and one each in 1916 and 1925. They represent 1/40 of the entire number of dyes, but typify the interlocked and interlaced manufacturing dependency as simply as possible. Other groups are far more complex chemically as well as from the point of view of manufacture and sale.

"*Ketone.*"—The starting material for these 24 dyes is called "Michler's Ketone," prepared from dimethyl anilin and carbonyl chloride. It was discovered in 1876. Dimethylanilin is made from anilin, anilin salt and acetone-free wood alcohol; anilin itself from nitrobenzol, and that from benzol and nitric acid.

Carbonyl chloride is made from equal volumes of carbon monoxide and chlorine by means of a contact agent, preferably animal charcoal; platinum has also been used. It is made chiefly by the process of Michalske (U. S. Pat. 808,100). In this process calcium chloride is heated with lime and coke breeze in an electric furnace; the carbonyl chloride is condensed as a liquid at 8° C. (about the freezing point of benzol). The carbonyl chloride gas is passed into the liquid dimethyl anilin at ordinary temperature until the weight increases 40 per cent.; the mixture is then heated to 100° C. for several hours to complete the reaction; the product is a solid melting at 174° C.

By using grain alcohol in place of the wood alcohol above, the corresponding ethyl product is obtained. It is not so important as the methyl product. "Ketone" is the nickname applied to the product made from dimethyl anilin, and "diketone" is that applied to the diethyl anilin product.

In general, dyes are made from ketone by treating a mixture of it with phosphorus oxychloride or phosphorus trichloride with another coal tar derivative; the operation technically known as condensing. In Fig. III the dyes are represented by squares; the material combined with ketone to produce any one of these dyes is indicated in the oval next preceding the square. Many modifications have been introduced as to the condensing agent; zinc chloride, aluminum chlorid, and sulphuric acid may be used in place of the phosphorus chlorides. In general, the phosphyous compounds are the best in this method. They appear finally as phosphoric or phosphorous acid. What is actually done with them is not definitely stated, but their conversion into phosphorus chlorides seems feasible and obvious.

The course of materials in making ketone and condensing it may reasonably be represented as follows:

A—Carbonyl chloride (31.21) + dimethylanilin (90.31), yield ketone (100) + 100 per cent. hydrochloric acid gas (21.24).

The figures in parentheses give the *theoretical proportions* for 100 parts of ketone; no account is here taken of losses.

B—Phosphorus oxychloride (100) + ketone (100)+Intermediate material, yield phosphoric acid (11.87) + 100 per cent. hydrochloric acid gas (13.25) + recoverable phosphorous oxychloride (81.47) + dye (x).

By-Products of these 24 Dyes.—Therefore, in making 100 lbs. of ketone and making dye therefrom, 34.49 lbs. of 100 per cent. hydrochloric acid gas or roughly 100 lbs. of 33 per cent. commercial muriatic acid are produced; of this only 30.51 per cent. are usable in making the hydrochloric salts of such of the dyes made in this class as are basic; the remainder, or 70 lbs., of commercial muriatic is available for other purposes.

Table V. gives relevant data of the 24 dyes. Only 9 are basic and in the 15 others the whole of the commercial muriatic producible is available for other purposes. Data as to the relative amounts produced of these 24 dyes are not available.

The manufacture from ketone of these 24 dyes calls for eleven chemical operations:

1. Nitrating.
2. Chlorinating.
3. Sulfonating.
4. Reducing.
5. Oxidizing.
6. Caustic melting.
7. Alkylating.
8. Liming.
9. Condensing.
10. Carboxylating.
11. Diazotizing and coupling.

TABLE V.—*Data on Dyes of Fig. III.*

Schultz No. (1912).	The Twenty-four Dyes.	Acid.	Basic.	Cotton Mordanted.	Wool.	Chrome Wool.	Silk.	Never Patented.	Expiration of Patent.	Parts from 100 parts ketone.
	Red.									
550(*a*)	Chrome bordeaux..	x	..	..	..	x	..	x	....	150
	Yellow.									
493(*b*)	Auramine.....	..	x	x	x	..	..	..	1901	113
	Green.									
509	Chrome green.....	x	..	..	..	x	..	..	1900	145
542	Agalma green.....	x	..	..	x	..	x	..	1925	237
564	Eric green.....	x	..	..	x	..	x	..	1916	201
566	Wool green S.....	..	x	..	x	..	x	x	....	160
	Blue.									
498	Turquoise blue	..	x	x	..	..	x	x	....	145
522	Victoria blue 4 R..	..	x	x	x	..	x	..	1901	204
531	Eriocyanin A.....	x	..	..	x	..	..	x	....	272
558	Victoria blue R....	..	x	x	x	..	x	x	....	170
559	Victoria blue B....	..	x	..	..	..	..	..	1901	188
560	Night blue.....	..	x	x	x	..	x	x	....	184
562	Fast acid biue.....	x	..	..	x	..	..	x	....	177
563	New patent blue...	x	..	..	x	..	x	..	1915	177
565	Acid blue S.....	x	..	..	x	..	..	..	1915	239
567	Chrome blue.....	x	..	..	..	x	..	..	1910	164
	Violet.									
516	Crystal violet.....	..	x	x	..	x	x	..	1900	152
527	Acid violet 4 BN...	x	..	..	x	..	..	..	1903	274
528	Fast acid violet 10B.	x	..	..	x	..	..	x	....	279
548	Acid violet 6 BN ..	x	..	..	x	..	x	..	1910	293
549	Chrome violet.....	x	..	..	..	x	..	..	1909	145
561	Acid violet 5 BNS..	x	..	..	x	..	..	..	1915	180
518	Ethyl violet.....	..	x	x	x	..	x	..	1900	156
532	Alkali violet 6 B...	x	..	..	x	..	..	..	1903	200
	Totals.....	15	9	7	17	5	11	8	11	4605

(*a*) Also calico printing.
(*b*) Also paper, leather, jute, cocoanut fiber, artificial silk and lakes.

In making the ketone, four operations are employed:

Nitrating. Reducing. Alkylating. Condensing.

And twelve materials are needed:

Benzol.	Carbon monoxide.	Sulphuric acid.
Nitrobenzol.	Chlorine.	Iron filings.
Anilin.	Phosphorus.	Muriatic acids.
Wood alcohol.	Nitric acid.	Animal charcoal.

The product of these operations is *not* a dyestuff, but must be *condensed* with other products; in fact, we are only ready to begin to make a dye *after* we have made 18 additional compounds.

Table VI shows the operations and materials that are to be combined with ketone to make dyes.

For 12 of these 24 dyes *one* member of the four classes of organic materials

(I=Fatty series II=Benzol III=Toluol IV=Naphthalene)

is sufficient; for the other twelve the following combinations of materials are necessary:

Classes.	No. of Dyes.	Classes.	No. of Dyes.
I and II.....	4	III and IV.....	1
II and III.....	1	I, II and III.....	3
II and IV.....	1	I, II and IV.....	2

The operations required total 118; xx indicates that the operation has to be performed twice (see table VI.)

Coal-Tar Products Participation in the 24 Dyes.—In making the quantities of the 24 dyes given in Table V the material participation is as follows:

	Per Cent.	Per Cent.
Ketone.....	...	52.41
Benzol.....	7.58	...
Toluol.....	5.21	...
Naphthalene	11.42	...
Phenol	1.69	25.90
Sulfonation, alkylation, etc.....	...	21.97
Total.....		99.98

Of the ketone 58.21 per cent are benzol so that the total benzol participation in the 4605 parts is 37.91 per cent. That is, of the 4605 parts of these 24 dyes:

	Per Cent.	Per Cent.
Benzol.....	37.91	...
Toluol, makes up.....	5.21	...
Naphthalene	11.42	...
Phenol, makes up.....	1.69	...
Total.....		56.23
Ketone production makes up.....		21.80
Sulfonation, alkylation, etc., make up.....		21.97

It must not be forgotten that these 24 dyes are not made and sold in the proportions given in Table V. Therefore, to plan a works for these it must be known how the 24 individuals are to be distributed over the whole production to avoid waste of space, apparatus, material and time.

To carry out the 118 operations the different sets of apparatus are 11 or a multiple thereof, the multiple depends on the relative quantities of the dyes to be made and the time at which they must be manufactured. And further, one apparatus is not necessarily adapted for operation on different compounds,

It must be borne in mind that Fig. III does not attempt to show the manufacturing operations and steps necessary to accomplish the indicated results; nor the filtering operations, the preicipttations, the blowings off with steam and other means of mechanical separation. Between each two successive chemical alterations there are one or more mechanical operations, not indicated, as well as secondary chemical changes such as the conversion of sulfo-acids into salts; bases into salts; the separation of the salts from their liquids and their purification, drying and storing. In addition to all this there is the large amount of testing that must be done at all stages of each operation, and exhaustive and careful tests of each lot of product before it is passed from one step to the other, and of the finished dye before it is placed in the warehouse. Such a presentation would add nothing of moment for present purposes. but would make the chart so complicated as to rob it of most of its utility.

Not only are there a large number of operations, but these operations, while not always under accurate control. must generally be carried out with great refinement and exactitude. The buyers of dye-stuffs, as a rule, subject the purchased goods to severe tests and even if they do not, the competition between makers is so keen that they themselves have raised the standard of the goods.

That this industry is complex, interlaced and interlocked not only from the manufacturing point of view but the merchandizing viewpoint also must be clear from Fig. III which shows in the sketchiest of outline the inter-relationship of only 1/40 of the individuals of the industry.

American attempts to Develop a Dye Industry.—The *hydroquinone* diagram in Fig. VIII illustrates what American manufacturers

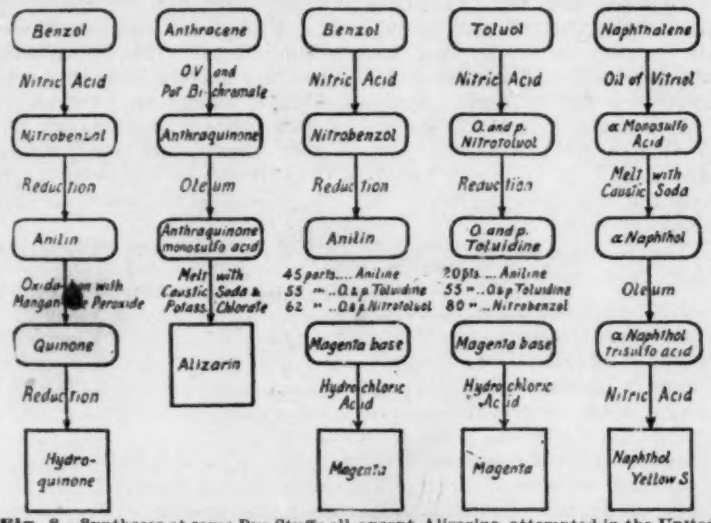


Fig. 8.—Syntheses of some Dye-Stuffs all except Alizarine, attempted in the United States and driven out by Foreign Competition.

have been doing with domestic benzol; it requires a total of four chemical operations and produces two compounds, each of them usuable as such, *i. e.*, anilin used for the production of black on cotton without the aid of any other coal-tar product, and hydroquinone used as a photographic developer. This diagram will give some measure of the difficulties that may be expected in an attempt to develop the finished intermediates necessary for the production of the 24 ketone dyes of Fig. III.

Magenta requires benzol and toluol; the former converted into nitrobenzol and then into anilin, and the latter into nitrotoluol and then reduced to toluidine; thess give the magenta base, which

TABLE VI.—*Materials and Operations of the 24 Dyes.*

Dye No.	Totals	Materials. I.	II.	III.	IV.	Transformation Numbers. 1	2	3	4	5	6	7	8	9	10	11	Totals.
550	1	..	x	..	..	..	..	..	x	x	..	..	..	..	x	x	4
493 (*a*)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	(*a*)
509	1	..	..	x	..	..	x	..	x	x	..	..	x	..	..	..	4
542	1	..	x	..	..	x	x	x	x	x	..	..	..	x	..	..	6
565	1	..	..	..	x	..	..	xx	x	x	..	..	x	..	..	..	5
566	1	..	..	..	x	x	..	x	x	..	x	..	..	x	..	..	5
498	1	..	..	x	..	x	..	..	x	x	..	..	..	..	..	..	3
522	3	x	x	..	x	xx	..	..	xx	..	..	x	..	x	..	..	6
531	3	x	x	x	..	x	x	x	xx	x	..	..	..	x	..	..	7
558	3	x	x	..	x	xx	..	..	xx	..	..	x	..	..	..	..	5
559	2	..	x	..	x	xx	..	..	xx	..	..	x	..	x	..	..	6
560	2	..	..	x	x	x	..	x	x	..	x	..	x	x	..	..	6
562	1	..	..	..	x	x	..	x	xx	x	..	..	x	..	..	..	6
563	1	..	..	..	x	x	..	x	xx	x	..	..	x	..	..	..	6
564	1	..	..	..	x	..	..	x	x	x	..	..	x	..	..	..	4
567	1	..	..	..	x	..	..	x	x	x	x	..	x	..	x	..	6
516	2	x	x	..	..	x	..	..	x	..	..	x	..	..	..	..	3
527	3	x	x	x	..	x	x	..	x	..	..	x	..	x	..	..	5
528	3	x	x	x	..	x	x	..	xx	x	..	x	..	x	..	..	7
548	2	..	x	x	..	xx	..	x	xx	..	x	x	..	x	..	..	8
549	1	..	x	..	..	..	..	..	x	x	..	..	..	..	x	..	3
561	3	x	x	..	x	x	..	x	x	..	x	..	x	x	..	..	6
518	2	x	x	..	..	x	..	..	x	..	..	x	..	..	..	..	3
532	2	x	x	..	..	x	..	x	x	..	..	..	..	x	..	..	4
Totals	41	9	14	7	11	21	5	13	31	12	5	8	8	11	3	1	118

(*a*) No' 491 (auramine) uses double chloride of zinc and ammonia only, in addition to "ketone."

on treatment with hydrochloric acid, yields hydrochloride, the commercial form of magenta.

A book of 280 pages, published in 1889, contained plates and drawings of apparatus and lay-out of works and minute directions for magenta manufacture, but even this and the absence of patents has not enabled American manufacturers to make this product in competition. Magenta is still made in this country, but almost entirely from imported magenta base.

The Naphthol Yellow S patent has been dead 17 years, and yet none of this dye has ever been successfully manufactured from napthalene in this country; although a little has been made from alpha-naphtholtrisulfoacid, imported from abroad.

Alizarin manufacture involves three chemical transformations of anthracene, which had always been procurable as cheap in the United States as in Germany; the reputation of alizarin as a money maker is world-wide, and the United States has always been a good consumer, yet no concern in this country has ever taken up its manufacture. It is possible that the fact that alizarin never was protected by tariff may have prevented such effort, but certainly with the patent dead 28 years it cannot have stood in the way.

Many of the other dyes said to be made in the United States are made in the same way as Magenta and Naphthol Yellow S; that is, the bulk of the chemical work is done in Germany, and merely the finishing touches in this country. Obviously the bulk of the profit is not in the "assembling." These two examples show clearly that a working clause in the patent law does not necessarily produce a coal-tar industry. The patent is taken out on the commercial form, and any product prior to the commercial form is not the subject of the patent. Merely putting on the finishing touches is a long ways from a true industry. France has had a working clause for a great many years, Great Britain for only seven, yet neither country today can make its dyestuffs simply because they have both been purchasing from Germany materials which bear the same relationship to the finished product that magenta base bears to commercial magenta, and alpha-naphthol-trisulfoacid to Naphthol Yellow S. A real industry requires making all materials from the crudes.

Why Germany Controls the Coal-Tar Industry.—The interlocked dependence of intermediates and finished dyes shown, and the facts that the Genman works have long ago paid for their plants, their experience and their sales organization, is why Germany controls the world's coal-tar dye market. In fact, the industry. taking everything into account, is just about a one-nation business. It is made up of a large number of small units, with all the units essential to success. Germany has established this business in 33 other countries; it is evident that any country starting now will be greatly handicapped.

Although Germany has relied upon Great Britain for its crudes, i. e., benzol, toluol, napthalene and anthracene, up to the middle of the 90's, England has not made any headway as a competitor in dye manufacture. Many of the non-patented dyes are also non-patented in England, yet most of Great Br!tain's requirements in them have always been supplied by Germany. It cannot be said that Great Britain is without highly developed chemical industries. A German chemist well equipped to exprsss an opinion, said this: "England is still ahead of us in many branches of the chemical industry, especially in inorganic manufacture. But in no country on earth are those branches of the chemical industry which demand versatility of thought, and particularly a large body of scientifically trained employees, so well developed as with us. Our synthetic dye, synthetic drug and perfumery industries are foremost throughout the world; and there is probably no country in which the heads of factories are so imbued with the conviction that their employees must needs cast a glance beyond domestic boundaries."

Every chemical manufacturing country of Europe buys more intermediate products from Germany than it sells to her, and all except Switzerland buy more dyestuffs from Germany than they sell her. In other words, all the world, outside of Germany, merely assembles intermediates purchased from her into finished dyes; Germany alone makes all its intermediates. Needless to say, the one who controls the manufacture of dye-parts actually controls the manufacture of dyes.

When Austria, Belgium, France, Great Britain, Italy, Russia and Switzerland singly and combined, have failed to take away this business from Germany, the American chemist should not be blamed because he has not succeeded; nor should it be assumed that transplanting of the whole industry is as easy a thing to do as so many seem to think. The transplanting of that industry from Germany is an undertaking properly described as titanic.

In 1913 Germany had for sale to foreigners $3 worth of these products as against every dollar's worth needed at home. The total coal-tar dye product of the United States constitute less than 0.4 per cent. of our entire import bnsiness. Nine hundred different dyes are on the American markets, only 100 of them made and assembled in this country from intermediates purchased from Germany. How less than 900 will satisfy American users is known only to them and to the importers. The latter cannot be expected to divulge this; if the former want substantial help from American chemical makers they must tell.

In 1909 the United States produced $2,462,436 worth of artificial dyes that are probably anilin dyes in the strict sense. Compared with Switzlerland's $3,200,000 production, *i. e.*, "assembled," in 1896, this is an achievement of which Americans need not be ashamed. The wonder is not that we have not done more, but that in the face of the well organized manufacturing plants of Germany and her very much superior facilities for foreign trade, that we have done so much. The users of dyes have invariably opposed tariff enactment that would encourage domestic production of coal tar dyes. That so many are produced is not due to co-operation of dyestuff users, but in spite of their obstruction; and if to-day the

users are in difficulty through a lack of dyestuffs they have their own shortsightedness to blame. With proper help and encouragement American chemists could increase domestic production of coal tar dyes, and inaugurate the making of intermediates; in the course of time this country might then ultimately look forward to a subtial share of the world's coal-tar dye business.

Scarcely any of the valuable intermediates are patented; chemists have patented finished dyes made from non-patented intermediates. These inventors, although free to make the needful intermediates, and an exclusive right to make, sell and use their new dyes, bought their intermediates from Germany. The patent situation is, therefore, really, that Germany excelled the rest of the world in making patentable combinations from non-patented and non-patentable intermediates; and further in making those intermediates in open competition with the rest of the world. So it appears that the rest of the world let the Germans do all the hard work, and when they finally woke up to the value of what Germany had accomplished, got very busy making excuses and explaining, instead of making a determined attempt to recover the ground lost. That such recovery will require the hardest kind of work on the part of all—users, capitalists, consumers and makers—is evident. The question is: Do we want to pay the price? It can be done.

How to Secure All-Gas Kitchens in Old Houses.

[Prepared by HERBERT K. DODSON, for the Minneapolis Meeting, N. C. G. A.]

The subject "All-Gas Kitchens" has had a place in the discussions at every meeting of this body and rightly so; for to solve this problem is to insure the use of gas for cooking 365 days in the year. Through selling expense and installation cost, we have an investment in a gas range in practically every home connected with our distribution systems; and it is highly desirable that we create a situation by which the revenue produced by these ranges shall be continuous. This can be accomplished only by the use of gas for cooking the year round; which imposes upon gas companies the providing means of heating the kitchen during the winter months and supplying hot water throughout the year.

Most of us think this business can be secured without much effort, that the public is thoroughly familiar with the all-gas kitchen and is waiting an opportune time to modernize that room. This is a mistaken idea, for after all our efforts to secure this business, there are still those who really do not know what we mean by, nor appreciate the advantages of, an all-gas kitchen. So little has been accomplished compared with the large amount of business to be obtained, that this field must still be considered virgin territory. We must, therefore, not permit our interest or our endeavors to lag; but must continually present the proposition in an attractive and convincing manner to inspire enthusiasm for the all-gas outfit.

In presenting this paper, we can but consider the subject in a general way, each company to supply the details applicable to its local conditions, such as the construction of the houses, the climate, etc. With this in view, communications were sent to a large number of gas companies asking their methods of securing all-gas kitchens in old dwellings. Interesting information was received which confirmed the opinion that, generally speaking, the majority of all-gas kitchen sales are the result of a gradual development through the installation of, first, the gas range, then the water heater and, finally, the all-gas kitchen. When the gas range was first introduced it was necessary to do a great deal of missionary work; so, when advocating gas for cooking the year round, the public must be convinced of its practicability before results can be obtained.

It must be remembered in soliciting this business, that there are three distinct classes of trade to which gas companies cater: first, those that can afford to have a complete installation made at one time, but are ultra-conservative; second, the class that is progressive and can afford the investment, and from which the majority of the business is secured; and third, the masses who are in daily touch with their culinary department, and easily convinced of the practicability of an all-gas kitchen, but whose circumstances will permit of only gradual installation. The wealthy class is not interested in appliances for the culinary department, but in the results obtained; because that branch of the household is generally left entirely to the servants. It is exceedingly difficult to reach this class, or to arouse their interest in the advantages and economical results obtainable by an all-gas kitchen. Your advertising matter is scarcely read by them. Cooking demonstrations before women's clubs are effective, and the all-gas installations in institutions, clubs, hospitals and colleges help. Through their associations with committees on management, and boards of directors, the attention of these people is brought to the all-gas kitchen; they are made familiar with the results obtained; and their interest in an all-gas kitchen for their home is excited. In this case, the head of the family must finally be consulted, and an effective method of reaching him is through solicitation at his place of business by a representative personally known to him. The second and third classes may be taken as one group. They are the customers who keep in close touch with, and are, conseqqently, interested in the culinary work of the home. The value of gas for cooking, as well as its ease and convenience of operation, is brought directly to their attention three times a day; and, when it comes to the sale of gas appliances, it is the woman of the family with whom we must deal. There are two factors in the sale of all-gas kitchens so fundamental as to need but the briefest mention. These are price and terms. The price must be reasonable and the terms such that the equipment will be within convenient reach of all. Many customers interested in all-gas kitchens think they are not in a position to have a complete equipment installed at one time, notwithstanding liberal and convenient terms.

In many cases they insist upon the coal range remaining. They have been so long accustomed to its heating the rear of their dwellings during the winter and taking the chill off the house in the late fall and early spring, that it is difficult to convince them that between seasons it is practically no more expensive to operate the heating system so as to heat the whole house, than to maintain a fire in the coal range in the kitchen for the purpose of heating only a portion of it. It is important to bring to the minds of the customers, particularly those having domestic help, that where the coal range is allowed to remain in the kitchen a fire is almost invariably built in it as a matter of habit; and the gas range is also used as a convenience each day; entailing double expense. In many instances, however, these conditions do not exist very long, for although the coal range remains in the kitchen, the housekeeper becomes accustomed to the quick service possible with the gas range and it is used almost constantly. She soon realizes the convenience and comfort resulting from its use, and other means are provided for heating the rear of the house; and a gas water heater and the furnace connection when practicable, and, finally, an all gas kitchen is established.

The sale of all-gas kitchens for new houses is easy compared with the effort necessary to secure this business in old dwellings; for an architect or builder wants to make his house so attractive and modern in every particular as to induce ready sale. Often the demand for all-gas kitchens in new houses is influenced by those already in old houses; as installations in old houses are likewise influenced by those in the new house.

The majority of coal ranges in old dwellings are designed, as already stated, to heat the rear of the house, as well as for cooking and for heating water. In houses having a central heating plant, if the furnace is sufficiently large to supply heat for the kitchen and, when necessary, the room above, a hot air flue can be extended or steam or hot water connections made. Thus the coal range may be eliminated, and the furnace water heater connection installed to heat the kitchen, and supply hot water for household purposes during the winter. If the furnace cannot supply heat for the kitchen, coal or coke kitchen heaters may be used; sufficient heat may be had by leaving the cellar door open; the heat from the adjoining room may be sufficient; or a gas heater may be placed in the kitchen. In houses where there is no central heating plant, and wall or portable coal stoves are in the rooms on the first floor, the heat from the adjoining room may be sufficient for the kitchen, or gas heaters may be installed. Varying conditions do not warrant a set rule for the installation of an all-gas kitchen, each installation must receive special attention. Our aim should be to remove the coal range. The customer's objections can usually be overcome, and experience shows that the customer will later express gratification at its removal.

There should be an everlasting, vigorous pounding on the slogan "All Gas Kitchens." Whenever a customer is approached, the all gas kitchen should be uppermost in the mind of the representative. In advertising any appliance for the culinary department, the all gas kitchen should be used as a background. Gas bills are a splendid means of bringing this subject to the attention of every customer, by illustrations and effective sales talk on the back, and stickers on the face of the bills. Large newspaper advertisements at intervals will prove more effective than constant runs of small advertisements. Attractive window displays also play an important part in securing this class of business. A fully equipped all

gas kitchen should be a conspicuous part of the salesroom. Cooking demonstrations in various parts of the city aid the cause.

For placing advertising matter where it is most needed, there is no better means than through the information that can be secured by the meter readers at very slight inconvenience to them, and at practically no cost to the company. In 85 per cent. of the meter readings in Baltimore the employee passes through the kitchen to the cellar, which enables him to gather whatever information may be desired concerning all-gas kitchens; and is noted in a corner of the meter reading slip by a check mark, the notation being erased when it has served its purpose. From this information a list is prepared of probable prospects for all-gas kitchens.

The leads' plan offers an opportunity for every employee to report such prospects. This plan, as operated in a number of companies, consists of the distribution of a leather covered pad of blank paper, pocket size, from which the sheet may be torn and sent to the lead desk. Every employee of a utility company is continually in contact with those having need of the service of his company, and they bring their needs to his attention. The lead book provides a ready means of sending this information to the new business or other departments.

A card file of prospects should be established, and an advertising campaign conducted from it. Circular letters relating advantages of the all-gas kitchen should be sent to each prospective customer, followed by booklets and circulars. The effectiveness of this advertising can be increased by the use of photographs or half tone plates of actual installations, giving the addresses and, where permissible, the names of the users. The addressograph can be profitably used when it is desired to send advertising to all customers in any particular section of the city. This advertising stimulates the interest of the customer, and is an opening wedge for the salesman, on whom largely depends the success of securing all-gas kitchens. The salesman should be thoroughly schooled to meet intelligently the problems which may be presented. He should be equipped with photographs or drawings and prices of the various classses of work which may be required in closing a contract. Unfortunately, at times it is necessary to place men on the street who are not familiar with all the details of an all-gas kitchen installation, especially the use of the furnace for additional heating. When such cases arise, they should be referred to someone who can assist the salesman to close the sale. The salesman, however, should receive credit for the sale.

The credit or point system of remuneration of representatives has been found to encourage the men to greater efforts towards securing this class of business. They should receive compensating credit for the removal of a coal range.

At this point, it is well to call attention to the field for all-gas kitchens in the homes of employees of gas companies. At a matter of domestic economy, and of faith in his own proposition, every gas man should cook exclusively with gas. Companies will be surprised at the amount of business that can be obtained among their employees. An added advantage is the effect on the community when a man practices what he preaches.

The great number of rented houses makes it imperative that we popularize the all-gas kitchen to such an extent that the owners of old properties will be compelled, in self-defense to place all-gas kitchens in them. This is one of the most serious problems confronting us, and one which has not been aggressively pushed. Through the real estate exchanges, the permits issued by building inspectors and notices of the improvement or transfer of property, information is obtainable which is of great assistance in approaching owners at the proper time. Special inducements must be offered to custamers to secure all-gas kitchens. Cost, liberal terms, economy, convenience, comfort, no dirt or ashes, sanitary conditions, have been the talking points; and an additional effective inducement is the guarantee used by the Baltimore company which says:

"If, after we have modernized your kitchen by removing your coal range and installing gas appliances, and you have cooked with gas exclusively, you should become dissatisfied within a period of one year from the date of the completion of the work, we will remove the gas appliances and connections, credit your account with the cost of the appliances, and reconnect the old coal range without charge."

An aid in the solicitation of all-gas kitchens is to plan the complete kitchen with suggestions as to the fireplace, plastering the hearth, painting for the wall, floor coverings, and present this plan, in blue print form together with a plan of the old kitchen, to the prospective customer. It should always be borne in mind that there must be no interruption in service, during the transition from the old to the new kitchen conditions. Where a great deal of work is entailed, and the customer is likely to be without means of cooking or heating, temporary appliances should be installed. The coal range removed should be left with the customer to be sold or relegated to the junk pile; or, if the salesman is alert, he will know where the coal range can be disposed of without detriment to future all-gas kitchen sales.

In selling all-gas kitchens, it is highly desirable that the orders be executed promptly and intelligently. The manner in which the work is done will inevitably cause either favorable or unfavorable comment on the part of the customer, and will, consequently, have a desirable or undesirable effect on future sales. It is best to recommend the elevated oven range for all-gas kitchens, but we should not let our enthusiasm sway our judgment nor lessen our desire to satisfy the customer.

It will be helpful to have the views of the gas industry on the following queries, which suggest themselves in securing all-gas kitchens in old houses. Considering the large number of kitchens still to be converted, and the revenue possible therefrom, should the price of an all-gas kitchen be made sufficient to cover the cost of the installation, overhead expenses, and include a profit; or, to what extent should installations be carried as a new business expense justified by the sale of gas? As tenated properties are the most difficult in which to secure all-gas kitchen installations, what efforts should be exerted toward inducing landlords and agents to install them in these houses? Should there be an agreement with plumbers or dealers concerning the securing of all-gas kitchens in old houses? Would the employment of saleswomen prove advantageous? As the sale of all-gas kitchens depends largely upon personal solicitation, how can the services of representatives capable of satisfactorily handling this important work be secured?

Plan of an All-Gas Kitchen Campaign.

A. Campaign to continue three months.

B. The advertising to be used to consist of:

1. A booklet containing cuts of residences equipped with all-gas kitchens and cuts showing all-gas kitchens. These to be mailed to customers who are to be called upon by the all-gas kitchen squad.
2. Window displays.
3. Gas bills.
4. Advertisements in the newspapers.

C. 1. Soliciting to be done by the sales force.
2. Plan of calls—outlined from prospect cards. The houses heated by central heating plants to be considered first.

D. Equipment of Salesmen.—In connection with the salesman's handbook, to have cuts descriptive of all-gas kitchens, a list of addresses of all-gas kitchen installations. and a blue print of a complete installation.

E. The salesman to be paid under the credit or point system.

F. Salesmen, in addition to their regular schooling, to be given special instructions as to the sale and installation of appliances suitable for all-gas kitchens, at meetings held during the week previous to the campaign.

G. The squad to work under a man having supervision of routes, estimates, plans, orders, window decorations, and other details of the campaign.

H. The members of the squad to report to the office each morning at 8 o'clock.

I. Prospects for all-gas kitchens received from sections worked or being worked by the all-gas kitchen squad to be turned over to it.

J. Installations to be made promptly by the Distribution Department.

An All-Gas Kitchen Means to Cook with Gas Throughout the Year.

Convenience.—The fire is ready when you are ready. No kindling to prepare. No carrying coal or emptying ashes.

Economy.—There is no expense of keeping up the fire when through cooking. No waste of time waiting for the fire to "catch up." No wasted foodstuffs through overheated or underheated ovens.

Comfort.—The instantaneous regulation of heat. No building of fires. No ash-dust or smoke to mar the kitchen's cleanliness. Heat when you want it, where you want it, while you want it, and no longer,

Hundreds of other advantages as inportant as those above named are enjoyed by those who Cook with Gas.

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SANFORD K. CAMPBELL, Editor.

NEW YORK, MONDAY, DECEMBER 28, 1914.

For a Model Compensation Law.

Last week's meeting of the Workman's Compensation Committee of the National Civic Federation, was to consider changes in the New York law.

The desire is to make the New York Workmen's Compensation Law a model for other States, and its provisions, when adequately amended, are to be put in the hands of legislators of 41 States who meet next year. In order that the employees and employers may agree on the amendments, a conference will be held between five representatives of the State Federation of Laber, five employers and five committeemen, the last ten to be selected by the Workmen's Compensation Committe. Suggestions will be welcomed by this conference from representatives of all labor and employers' organizations.

The preliminary conference on Wednesday last disclosed what may be perhaps the most important changes proposed for the law:

When a man is laid off on account of disability for a period of more than four weeks he is to be paid from the beginning of the waiting period.

State funds shall be the only form of insurance.

Direct payment shall be made to the workman suffering disability, or, in case of death, to his beneficiaries.

The waiting period caused by disability, shall be cut off entirely.

Employers shall furnish medical assistance to injured workmen without waiting for the employee to make demand for it.

The compensation field shall be extended to occupations not now included.

These and other changes were suggested by representatives of labor organizations and employers who have had opportunity to see where the Compensation Act may be improved. By coincidence most of the proposed amendments were indorsed by the Workmen's Compensation Department of the National Civic Federation, headed by August Belmont, which prepared independently a tentative draft of amendments to the law.

The Alfred T. White Prize.

At the annual banquet of the Brooklyn (N. Y.) Engineers' Club, the Alfred T. White Prize for the best formal paper presented during the year was awarded to Mr. L. S. Stiles, Construction Engineer, Brooklyn Union Gas Company, for his paper on "Gas Engines as Prime Movers for Power and Electric Stations, and Their Application to the Modern Gas Pumping Station," which he read on the evening of May 14th. The prize, founded by Mr. Alfred T. White, a prominent Brooklyn engineer, includes an appropriate diploma and $50 in gold. The class of papers heard at the Engineers' Club is of very high order, and the compliment to Mr. Stiles is the greater for that reason.

A Solution of the Rate Problem.

Man proposes but war diposes—the English sliding scale has broken down under the stress of war conditions. In the able contribution in other columns from Mr. Norton H. Humphreys, the controlling factors of this much extolled rate panacea are carefully analyzed, and it becomes apparent that conditions beyond the control of the management really determine the cost of production whenever the labor and material market do not move in normal channels. A sliding scale based on economics of operation with an arbitrary labor rate and material cost would seem a satisfactory solution.

There will be many changes of rates in this country, and unless some concerted action is taken we are likely to suffer from individual applications as varied and as many as there are companies.

We have the advantage of numerous trials in Great Britain with gas rates, and in this country with electric rates, and can profit by utilizing these experiences to establish a rate system that will be simple of application and just to company and consumer.

Enhancing the Value of Coal Tar.

Practically every pronouncement of business optimism has been tempered by the statement that we are to prosper by readjustments. America will prosper in the next generation as it has in the one just past, but opportunities will be along lines of greater scope, of more complicated activity and, broadly speaking, through even greater specialization.

Greater returns from Coal Tar products can be brought about through the co-operation of the gas fraternity, in fact, we must help if anything is to be accomplished along these lines.

The address of Mr. Bernhard C. Hesse which we have presented in abridged form for our readers, shows the magnitude of the Coal Tar Dye Industry and the breadth of its ramifications.

There are three bodies ready that must work together to get anything done, and it appears to us that the American Gas Institute is the logical body to bring about concerted action by Gas Companies, the United States Government and the manufacturers of chemicals.

To quote from Mr. Hesse: "It can be done."

[Official Notice.]

Wisconsin Gas Association.

Office of the Secretary-Treasurer,
Milwaukee, Wis., Dec. 10, 1914.

To the Members of the Wisconsin Gas Association: Under instructions contained in a resolution adopted at our last annual meeting, your Executive Committee has completed arrangements by which the Annual Convention of the Wisconsin Gas Association will be held jointly with the Wisconsin Electric Association, on January 20th, 21st and 22d, 1915, at the Hotel Pfister, Milwaukee.

The first day of the meeting will be devoted to matters pertaining to gas interests, including the usual order of business provided under our constitution. The second day's session will be held jointly with the Wisconsin Electric Association for the presentation and discussion of subjects of common interest. The banquet will be on the evening of the second day, this also a joint affair.

The third day will be devoted exclusively to the business of the Electric Association.

Papers on appropriate subjects are in the course of preparation, the titles of which, and other details relative to the convention, will be given in a later announcement.

In order to determine the advisability of continuing our annual meetings in conjunction with those of the Electric Association, it is particularly desirable that this meeting be well attended, so that any action which may be taken relative to this subject represent as nearly as possible the unanimous wish of our Association. Remember the new dates—January 20th, 21st and 22d, 1915.

Respectfully, Henry Harman,
Secretary-Treasurer.

SPECIAL ENGLISH CORRESPONDENCE.

MONTHLY LETTER FROM NORTON H. HUMPHRYS, SALISBURY, ENGLAND.

THE GAS INDUSTRY AND THE WAR.—EVEN CHEAP GAS WILL NOT SELL ITSELF.

The present position of public affairs is of importance to our industry in more ways than one, and if long continued may call for special Acts of Parliament; because financial and other considerations have now arisen that were not contemplated and therefore not provided for in the framing of the various clauses in Provisional Orders and Private Acts which control the issue of capital, payment of dividends, and selling prices of gas in Great Britain. First, as to the raising of new capital: Many undertakings supplying naval, military, or certain special industrial centres, are experiencing substantial increases in the demand for gas, perhaps 10, perhaps 15 per cent over the corresponding month last year, which, under present regulations, they are compelled to meet. The situation has been aggravated by a spell of cold weather, with the result that the records for the month of November, just closed, will exceed those of the previous December or January. This directs immediate consideration to the capability of existing manufacturing, purifying, and distributing plant, and the placing of orders for extensions, which necessitates the issue of new capital. The prospects of a step of this character are not favorable, and unfortunately there is uo immediate hope of improvement. Rather the reverse. It is no use to try to stave off the evil day. Capital cannot to-day be obtained on anything like what may be called normal terms. Debentures bearing 3½ per cent. interest would not sell at par or anything like it, and the same may be said of shares carrying 5 per cent. dividend. And in many cases there is good reason to believe that the increase is of a temporary and not of a sound permanent character. Under such circumstances, it may be a wise policy to stop, for the time being, anything in the way of pushing salesmanship. Very few companies have been bold enough to invite subscriptions for new capital during the last four months, and the limited number of parcels that have been advertised are for the most part small in amount, perhaps not sufficient to give a fair indication. But on the principle that straws show which way the wind blows, it would appear that investors will not plank down for anything less than 5 or 6 per cent. interest. A suggestion has been put forward to the effect that the position might be assisted by increased borrowing powers. For some reason or other, which is not very obvious, the rule. up to a recent date, has been to tie gas undertakings, with few exceptions, down to a limit of 25 per cent. They must get £4,000 paid-up share capital before they can issue £1,000 in debentures. Other trading concerns, certainly not in a position to offer better security, are allowed to borrow up to one-third or one-half, and even at the higher limit the security offered by a well conducted gas undertaking would rank high in the financial market. The offer of debentures would appeal to the large class of investors who look for safety rather than a high rate of interest. The position is aggravated, in the case of gas undertakings subject to the sliding scale, under which the rate of dividend varies according to the selling price. The object of this regulation is to enable the shareholders to participate in any profit due to economical or skilful management, or on the other hand, to make them share in losses brought about by negligence or extravagance. But the weak point is that it does not discriminate. A reduction in the selling price, say 2d per 1,000 cubic feet, may be brought about by the introduction of improvements at the works, which have the effect of reducing the working costs. Or it may be due to reduced prices of materials and labor. A rise in the price may be necessitated by bad working results, or by increased prices of materials and labor. The first named cause in each case is the one contemplated by the framers of the ragulation; the second is a mere incident. At the present juncture there is a combination of causes, higher priced material, dearer labor and dearer capital, all tending to increased expenditure, and all beyond human control. If this condition obtains a prolonged holding or important dimensions, it will be necessary to make a sliding scale dependent on discrimination, and confined to the class of increment or decrement to which it was intended to apply and not to uncontrollable fluctuations in prices. This could only be done by special Act of Parliament. All these causes have some bearing on the selling price of gas. Companies under standard rates of dividend are better off, because they have a maximum price that was fixed years ago, and which is 25 to 50 per cent. in excess of the present selling price. Many undertakings are to-day selling at about 3s. 0d. per 1,000 cubic feet, while the maximum price laid down in their Act of Parliament is 4s. 6d. or 5s., and as long as they keep below that limit there is no restriction as to dividend. But the initial price fixed as a basis for the operations of the sliding scale comes much nearer to the actual selling price, and therefor does not leave a substantial margin to cover uncontrollable contingencies, and must therefore lead to reduced rates of dividend, which in their turn will influence the terms on which new capital can be obtained.

The position of the manager of a gas works, at the best of times, is a long distance from the proverbial bed of roses, but in war time the distance is very much more pronounced. First, there is the inroad upon such of his staff as are eligible for military service, which usually comprises the bulk of the retort house gangs. In addition to that, there is a large demand for unskilled labor on the part of the Government, for which panic rates of wages are offered, which does not aid in the work of securing substitutes. Drafts on the outdoor staff are, of course, not so serious, because a large proportion of the work can be postponed, perhaps for some weeks without serious results. There is nothing corresponding to the prompt measures that must be taken at the works if the gasholders are to be kept afloat. Prices of materials have advanced, but apart from that there has been no actual shortage. The chief difficulty has been with the railway companies, who, on account of military requirements, are frequently three weeks or so in arrears with deliveries. Where they accommodate the accumulation I cannot imagine. They must have enormous resources of siding room and warehouse accommodation.

The Leeds City Council, as the owners of the City and District Gas Supply, at their meeting a few days since had before them reports by Mr. W. B. Leech. the engineer and general manager, and by Mr. W. R. Herring, who had been called in as an outside expert, which for breadth of detail and width of objective, have rarely been equalled in any report set before a gas works governing body. Reading between the lines, it is evident that the undertaking has labored for many years under the special disadvantages incidental to municipal ownership. So long as gas was sold at a moderate price, there was no endeavor in the direction of keeping step with modern improvements and ideas. and money that should have been spent on renewals was carried to the relief of the Public Rates. Much of the apparatus at the works is admitted to be of an antiquated, if not obsolete character, and the commercial methods, if anything worthy of the name exists, are incomplete and inadequate both as regards sales of gas and of residuals. Out of some 61,000 ordinary and 51,000 slot consumers, only 17,000 use cookers, with the result that the sales per consumer do not compare favorably with those obtaining in other large northern towns. Yet the price of gas has been low, only 2s. 2d. per 1.000 cubic feet for lighting, and 1s. 11d. for engines. We must not forget that it has to compete with cheap coal; but after allowing for that, there is striking evidence that "cheap" gas will not sell itself, and that irrespective of the selling price, modern commercial methods must be applied if satisfactory results are to be secured. The sale per consumer depends on the latter condition rather than the former. Vendors of cheap gas cannot do without it, and those who, by virtue of necessity, must sell at higher prices need not be discouraged. Many undertakings selling at 3s. or more are to-day showing a better selling record than Leeds.

Mr. Leech evidently believes in taking the bull by the horns rather than in palliative half measures, and addresses himself to a very difficult position with a vigor and completeness that could not be surpassed. After pointing out that the present capital value of the undertaking is nearly two millions Sterling, and that the charge for interest and redemption is more than 8d. per 1,000 cubic feet of gas sold, he says that the only way of minimizing this burden is by largely increasing the sales, which can only be done by reducing the cost of production and lowering the selling price to the consumer. With the existing plant this is impossible, and he recommends reconstruction on an extensive scale at a cost of £140,000, by which an annual saving of £27,000 would be assured. At present the Leeds Gas Committee own three gas works: New Wortley, Meadow Lane and York Street, of which the last named is comparatively small and under the new scheme would be closed as a manufacturing station. New Wortley at present is capable of turning out

eight millions cubic feet per day, and Meadow Lane five millions. At each works, old-fashioned retort houses with direct fired furnaces are still retained in use, to the extent of perhaps 25 per cent. There is one house fitted with regenerator settings, also a set of 90 four-metre Dessau vertical retorts. For the present the proposed alterations at New Wortley are confined to matters of detail. Meadow Lane works is to be almost entirely reconstructed, the principal innovations being four benches of vertical retorts, conveyors in place of overhead railways, telpher conveyor, screening machinery, and overhead bins for coke, washiug plant for pan ashes, new turbo exhausters, additional scrubber-washers, and eight new purifying boxes, each 50 feet by 30 feet by 6 feet deep. with dry faced covers and direct connections, and an oxide handling plant. The carburetted water gas plant, at present equal to 2,700,000 cubic feet of gas per day, is to be altered and remodelled at a cost of £12,500, which would nearly double its capacity and reduce the working costs by nearly £3,000 per annum. As regards the outside operations, the principal novelties are the formation of a Commercial Department; a bonus to the meter inspectors for the introduction of outside lamps, cookers, or new consumers; and a sliding scale of charges to the consumers according to the quantity used, ranging up to nearly 25 per cent. reduction. The first effect of the rebates would be a loss of £4,000 per annum, which would be speedily reduced and eventually more than covered by the increased consumption. Mr. Herring, in his report, approves the entire scheme, and quotes figures and statistics at some length, that go to prove the existence of a large margin for increased business. The figures quoted for Leicester are remarkable. Out of 30,000 ordinary consumers, 17,000 use cookers; and amongst 40,000 slot users there are over 38,000 cookers. The average consumption per consumer is 55,488 cubic feet per annum for the ordinary, and 19,430 for the slot class. Alderman Penrose Green, in moving that the necessary funds should be obtained to enable the alterations and extensions suggested to be carried out, stated that the necessary money could be borrowed on terms of repayment in 15 years, at a cost of £12,000 per annum, which would leave a margin of £15,000 a year clear profit. The average increase in the sale of gas was 5 per cent. per annum, and the profits paid to the relief of the rates averaged more than £13,000 per annum over the last 16 years. The present standing charges for interest and sinking fund amounted to £86,000 per annum, exclusive of £16,000 paid to local rates; and in 20 years all the capital would be paid off, The motion was carried after a short discussion in the course of which it was stated that, out of a total of 120,000 houses in Leeds, 113,000 were already supplied with gas.

Report of N. C. G. A. Committee on Heating, Ventilation and Refrigeration.

GEORGE S. BARROWS, Chairman.

Heating.—It was hoped that we would be able to conduct experiments to give certain efficiency values to various types of heaters and make recommendations for their installation. Unfortunately, it was impossible to properly prosecute this line of investigation. and so it was deemed best to make a study of the methods and appliances most in use, or considered most desirable, and briefly discuss the advantages or disadvantages.

We sent a circular to eighty-three members of the Association and replies were received from fifty.

In it we asked for an expression of opinion on the types most desirable for certain specified purposes, and we believe the replies represent personal opinions governed, of course to some extent, by the practice of the company with which the person is connected.

We are gratified by the relatively large proportion of answers received, and trust that our epitome of the replies and our comments thereon may lead to a general discussion on this subject, and develop greater uniformity of practice; and indicate to manufacturers of appliances the most desirable lines on which to work in the future.

The questions were prepared with a view to covering as much in detail as possible, the different classes of rooms in which heaters are installed, and the various types of heaters and connections. In a number of cases complete replies were not received, and we assume that those answering had no definite choice of appliance or method. A summary of the replies received is given in the table:

The answers apparently indicate that in rooms where the space occupied by heating appliance is of considerable value to the occupant, a portable heater, which may be removed for storage during that part of the year when not in use, may be removed to a corner of the room, is preferable to a stationary heater. A general exception to this rule is in rooms where fireplaces are available for the installation of heaters.

There is no decided preference, when illuminating flame burners are used, for the flat flame over round or jet burner; but your committee believes that the flat flame burner is preferable if the proper type of burner is used, because there is less liability that it will blow or extend beyond the heater, and become a possible source of danger in case of an increase in pressure.

We are surprised at the number expressing a preference for asbestos back heaters, and hope there will be a full discussion on this. There are two general types of this heater. In the first the burner is at the bottom of the back; in the second, the one more commonly used, the back is a perforated plate with burner orifices over the entire surface. The first type has no very objectionable feature, although it is not particularly sightly, because only the lower part of the asbestos becomes incandescent. The second type is not efficient or desirable, because of the difficulty of getting sufficient secondary air to the upper burners, which lie directly in the path of the products of combustion from the lower orifices; and there is not perfect combustion from the upper burners.

The asbestos fibre, unless carefully maintained, is apt to become unsightly, and the expense of proper maintenance is not small.

The marked preference for radiators of the gas-steam type is interesting; and the reasons for it should provoke an interesting discussion. Considering the amount of energy in the form of heat obtained from the gas, it is neither more nor less efficient than any other good heater. When the gas is lighted there is a perceptible lapse of time before heat is given to surrounding objects, due to the absorption of the heat by the water; and after the gas is turned off there is a similar period during which heat is given off while the heater is cooling. As one of the advantages claimed for gas heating is instantaneous heat when wanted, and immediate cessation of the heating when turned off, it is interesting to know why this form of heater is preferred.

The committee believes that the very pronounced desire for solid pipe connections should be gratifying to the Association, and that we should continue our efforts to increase their use. Recent developments of flexible tubing having a flexible metallic core covered with a gas-tight composition, have greatly increased the value of flexible tubing; and a number of solid connections, mostly of the union type, have been devised to take the place of the present slip end. While none of these connections has been found entirely satisfactory, from among them some can be selected which will probably prove commercially successful. There has recently been marked improvement in the slip end, it being made of a better quality of rubber, and corrugated internally to reduce the probability of accidental displacement.

Your committee makes no comment on the answers to the questions on flue connections, except to express the opinion that flue connections are desirable where possible, and where not objectionable to the consumer. This is especially so where heaters are used for continuous heating, as unless the rooms are particularly well ventilated there may be annoyance from the condensation of the aqueous vapor in the products of combustion. The use of the damper is referred to, and your committee recommends that where dampers are used particular care be exercised to see that it is so constructed, either by perforations or by making it a loose fit in the pipe, that it will be impossible to entirely close the flue.

It is hoped that there will be some discussion of desirable finishes for heaters, particularly on the use of enamel. As you are aware, a competition for a design of fireplace heater is being conducted by a joint committee of the National Commercial Gas Association and American Gas Institute. As that committee will report at this meeting it is thought that nothing on it need be said by the Committee on Heating, Ventilation and Refrigeration.

We are glad that many of those who replied to the circular did not confine themselves to the tabular form, but added remarks, some of which are quoted in Exhibit "C."

Use of Room Heaters.—Because of anticipated tests of room heaters, no inquiries were made regarding desired sizes. As the tests were not made, no recommendation is possible, but we believe that the phase of the subject should be given careful consideration, for if the heater is either too small or too large the service will be unsatisfactory. The disadvantage of the small heater is obvious. The disadvantage of the large one disappears if it is connected to a flue, for it is objectionable only because of the vitation of the air, a point touched on in that part of the report referring to ventilation. Lesson VIII, Part III, of the Educational Course on Heating, treats on the sizes of heaters to use.

Care must be exercised in selecting heaters to use those which

Kind of Room.	Type of Heater.		Kind of Burner.								Method of Connections.							Material or Finish of Heater.				
			Open Flame.				Atmospheric				Gas.				Flue.							
	Stationary.	Portable.	Reflector Type.	Radiator—Round Type.	Jet Burner.	Flat Flame Burner.	Radiant Body.	Asbestos Back.	Gas Log.	Gas Steam Radiator.	Solid Pipe.	Slip End Flexible Tube.	Screwed End Flexible Tube.	Union End Flexible Tube.	Without Flue.	Flue and Damper.	Flue and no Damper.	Steel.	Cast Iron.	Brass, Copper or Bronze.	Aluminum.	Enamel.
Living room.....	30	20	28	1	16	15	9	6	11	2	30	13	1	7	26	12	7	16	8	15	..	11
Bed room.....	17	32	33	6	17	20	10	2	1	3	23	19	3	8	30	5	7	24	5	7	2	17
Schools, churches.	41	3	10	8	8	12	8	1	1	26	43	3	.	5	26	4	6	13	20	6	6	7
Theatres.....	74	1	8	7	7	9	9	1	1	30	45	1	.	1	28	3	6	14	2	6	7	5
Stores.....	40	5	9	8	10	6	8	1	1	31	39	5	.	2	28	4	5	13	22	5	7	3
Offices.....	28	22	17	7	13	15	11	1	1	22	31	2	3	6	34	2	4	16	21	5	5	13
Warehouses.....	31	13	9	11	9	11	10	1	1	23	33	7	1	5	29	4	4	15	18	4	5	4
Workrooms.....	30	18	18	13	9	14	10	1	1	22	35	7	1	7	29	3	6	19	19	4	4	8
	261	114	126	61	89	102	75	14	18	159	279	67	9	41	230	37	45	130	115	52	36	68

do not become dangerously hot. The temperatures below and on the sides and back, should not be so high as to cause scorching of the floor, walls or furniture near the heater. The front of the heater should be so protected that inflammable fabrics will not become ignited, even if not touching the heater.

It is assumed that only heaters in which combustion is perfect will be used. Perfect combustion is readily obtained with illuminating flame burners, if the air supply is ample and the flames do not touch any part of the heater. Similarly, perfect combustion can be obtained with atmospheric burners. As the latter do not so quickly show carbonization if the tips of the flames comes in contact with a part of the heater, it is often assumed that such contact is unobjectionable; but this should not be permitted, for unless the part touched by the flame is as hot as the temperature of ignition of the gas, there will be imperfect combustion. Because of this tendency to the improper use of atmospheric burners, and the possibility of flashing back, it is desirable to use illuminating flame heaters when flue connections are not made, except in rooms that are at all times well ventilated. Care should be taken to keep all heaters clean, and the air supplied for the burners or for passages over the heated surfaces as free from dust as possible. If attention is not given to this, complaints of odor are likely to occur.

Central Heating.—Your committee has been unable to obtain sufficient information on central heating to make any general recommendations. In but few cities is the price of artificial gas low enough to warrant such use, except in cases where expense is not considered. In the South, where the heating is of a light character, or more or less intermittent, the use of gas for this purpose, even at the prevailing prices, may often compete with other forms of fuel directly, and be cheaper if the expense of taking care of coal and ashes be considered. Those who desire information on such heating are referred to the paper by Mr. Krippner, presented at the meeting in Atlanta in 1912.

While central heating for the entire season is not often practical, an auxiliary central gas heater is often economical, and always an added convenience. In the spring and autumn there are periods of weeks when, at times, the house needs the chill taken off in the morning and possibly again in the evening. To operate a coal fire for this, even if for several days in succession, is both an expense and a nuisance, and as the need is usually intermittent, gas is obviously the best fuel. As the quantity of heat required is considerably less than demanded for mid-winter, a small heater will suffice. It should preferably be placed close to the coal heater, and connected to the heat distributing system, which may be hot air, hot water or steam. As coal heaters vary in type and size, it is often necessary to build a heater to suit the particular installation, especially when a hot-air system is used. Several manufacturers are building such appliances, and it is quite likely that these will prove more nearly universal than they have been supposed. For hot water or steam systems almost any gas water heater or steam boiler may be used. Your committee recommends a more energetic campaign to secure this business, for which gas is so admirably adapted.

Another kind of heating, which may be termed "central heating," is the use of gas-steam radiators in connection with low pressure steam heating systems. Most gas-steam radiators are so designed that they may be connected to the central heating system, and used with steam from the central plant, gas being used with them only when the central plant is not in operation. Such use is very desirable for intermittent heating during the spring and fall; and throughout the winter for large buildings, which for one or more days during the week may not be generally occupied. In such places it is not desirable to operate the central plant, and the few rooms which are occupied may be heated by lighting the gas under the radiators.

All-Gas-Kitchen Heating.—The increasing number of all-gas kitchens has shown the need for some means of heating kitchens other than by the gas range ovens. In most modern houses heat is provided, but the older houses depend on the coal range, which at the same time heats the water for domestic supply. Under the present average prices for gas and coal, and with present gas heaters, it is difficult to secure the heating of kitchens by gas. To keep the gas range in use during the winter is highly desirable, and this may be accomplished by the installation of a coal-fired hot water heater or a furnace connection supplying hot water for a radiator to heat the kitchen, and also for the domestic supply through the usual tank or boiler. Information on the best methods of making such connections, with formulæ for calculating the radiation required, can be found in the Lesson VIII, Part III, of the Educational Course.

Another means for heating kitchens is by the coal-fired "Kitchen Heater," either with or without a water back. Your committee does not consider this appliance as good as a water heater in the basement and radiator in the kitchen; for with the kitchen heater there is the annoyance of coal, ashes and dust in the kitchen. Its lower first cost, however, may make its installation preferable in some cases.

Ventilation.—This subject, unless limited, is obviously too broad for consideration in such a report, so your committee will confine the discussion to such phases as apply to rooms in which gas is, or may be, used primarily for lighting, heating or similar purposes, and by proper application be made to assist in the ventilation.

Seldom does the air of any room become dangerously vitiated except through carelessness of those responsible for the conditions. Insufficient provision for the admission of fresh air or the escape of foul air; or if there is sufficient air under ordinary circumstances, overcrowding; or the improper use of appliances; cause poor ventilation. We should not be satisfied simply to prevent such unhealthful conditions, but should attempt to provide comfort by keeping the air free from disagreeable odors, and its temperature from becoming excessive. Under ordinary conditions a complete change of air four times an hour will suffice. In a crowded or overheated room the air should be changed six times. The change of air may be effected by fans, or by allowing the warm air which rises to escape freely, its place being taken by cool fresh air entering. Ventilation induced by the escape of warmed air is obtained only at some loss of efficiency in the means for heating, but the loss is not excessive when compared with that of operating a mechanical system. If the heated air is from lights there is no loss, and where proper ceiling outlets are possible, an ordinary room may be cheaply and satisfactorily ventilated by this means alone, if the flues are practically vertical and so short that the air therein is kept appreciably warmer than that into which it is escaping. This method is best for buildings of one story, and may be employed where there is one main flue into which flues from each floor discharge.

In England and on the Continent a good many rooms, both public and private, are ventilated in this way with considerable success. In this country there have been but relatively few such installations

made, but where made they are successful. One gas company, in its new office building, provided ceiling ducts and wall outlets, and it is reported that the ventilation is very satisfactory. In another city the gas company, in a one-story district office, with a large number of appliances and lights burning throughout the day, avoided the expense of fans by installing ventilators and a fresh air duct beneath the floor; changing the atmosphere from one excessively vitiated to approximately normal.

The formula for the rate of discharge of air through a flue is the same as for draft in a chimney. It is somewhat difficult to determine the exact temperature which should be used, for there are a great many factors to be considered, not the least of which is the cooling of the air of the room by the opening of doors, particularly in the case of stores. By using thermometers the average temperature near the ceiling may be obtained, and the average outside temperature can be assumed, remembering that the volume of air discharged will be less in summer than in winter, because of the smaller difference in temperature between the air in the room and outside. In any case, the differential between the air inside and outside is relatively small; and because the direction and force of the wind, the proximity of adjacent buildings, and atmospheric conditions all have a marked effect on the draft, it is recommended that, except under very favorable conditions, some mechanical means of ventilation be used. It is urged that this matter of non-mechanical ventilation be given further consideration, and that its possibility be carefully studied.

Ventilation of living rooms and bed-rooms is usually obtained by opening windows; the most feasible plan because of structural conditions limiting the use of flues.

Many exhaustive studies have been made of the effect of burning gas on the atmosphere, and it seems to be pretty well proven that there is some sterilizing effect, because of the passage of large quantities of air through the flames. The most noticeable effects in a poorly ventilated room are odors and excessive heat. The odors are generally not from the products of combustion, but from dust burned or in contact with the hot parts of the heater, or sometimes from the material of the heater itself. To avoid these odors it is necessary to see that the heater is thoroughly "burned off" before installation, and kept clean. The overheating of a room is generally noticeable in rooms heated by some other means than a gas heater, and is usually where gas is used only for lighting. Where it is impossible to provide ducts to carry away the heated air from the upper part of the room, the temperature will seem high, not only because of the accumulation of this heated air, but also by radiation of heat from the ceiling heated by the air. Usually this high temperature can be avoided by slightly opening the windows at the top, and by opening them slightly at the bottom; or by providing some other means for an inflow of fresh air, the heated air will escape and the temperature of the room will be satisfactory.

Where the heater is set in a fireplace, or connected with the flue, the ventilation of the room is very much improved, because there is an appreciable flow of air induced by the escape of the products of combustion. There will still be, however, the possibility of high temperature from the collection of heated air in the upper part of the room, and odors caused by the contact of dust with the hot surfaces of the heater. The odor in a room heated by gas should not be more noticeable than in a room heated by other means, although where low pressure steam or hot water radiators are used, there will be less odor from burning dust, because of the relatively lower temperature of the heated surfaces. If electric radiators are used the conditions will be the same as with gas, for the temperatures of the heaters are about the same.

While a certain amount of air is required for maintaining combustion in gas heaters, and therefore more air should be admitted when gas heaters are used than when steam or hot water radiators or electric heaters are installed, the general properties of vitation are the same, and the same precautions should be used to provide fresh air.

Refrigeration.—The use of gas-operated refrigerating machines is of relatively recent development, although some machines have been in use for several years. These machines are all of the absorption type, in which heat is required only for vaporizing the ammonia, and any means of heat would do as well. Most of the systems on the market are of the non-automatic type; that is, the valves controlling the cycle are operated manually. There is, however, one machine in which the control is by thermostatic and pressure means.

The committee has made many inquiries regarding these systems, and finds there have been so few installed that we are not justified in making any recommendation at present. When it is possible to provide a proper system of inspection or maintenance, it is believed that the automatic type will prove satisfactory, aud that the cost of refrigeration to the consumer will be less than where ice is used. (This is not intended to apply to cities where natural ice is available at low cost.) In all cases large quantities of water are required for condensation, and we believe the cost of water has generally been underestimated.

Where careful and constant supervision is not possible, your committee believes that the automatic type should not be recommended. As in the non-automatic systems a number os valves must be operated in their proper sequence, the installation of such a machine is not desirable except where the operator is able to understand the function of the various parts. Ammonia, when uncontrolled. is very disagreeable, and wherever these machines are installed, great care must be exercised to see that connections are properly made. The annoyance caused the consumer if a refrigerating machine fails to work is much greater than in case of failure of most other appliances. Your committee recommends, in view of the large field for refrigerating apparatus of the absorption type, that the manufacturers of these machines be encouragod to develop them by making installations which may be under the supervision of the gas company, until such time as the practicability of the machine is assured; but that a general installation of these machines is not desirable at present.

EXHIBIT "C."—*This exhibit gives remarks made by individuals in replies to the letter sent out, and represent their opinions covering their own condition.*

1. "We endeavor to install heaters with iron pipe connections; otherwise we use metal tubing. We recommend the reflector and radiant types, but where the question of expense arises we use the open flame round heater."

2. "Solid connections always where possible on any appliance, and on logs and fireplace heaters always. Asbestos back heaters should be flue connected."

3. "Bronze finish preferred on all types of gas-steam radiators."

4. "Fireplace heaters desired wherever possible."

5. "The gas-steam radiators connected solid, and used as auxiliaries with usual steam heating system, is my preference. In most cases flues would not be available."

6. "In all cases where we have marked 'without flue,' it assumes the room is large and well ventilated."

7. "Stationary type of heater preferred, because it means permanent gas heating; but, unfortunately, this is possible only infrequently, so I have answered my questions assuming that portable heaters will usually be used."

8. "Do not recommend any heater in theatres or moving picture parlors,"

9. "Always connect to flue if possible."

10. "For schools, churches, theatres, offices, warehouses and workrooms, permanent connections are preferred,; and where intermittent use is necessary, heaters of the portable, reflector type are best. We always attempt to finish the heater to match the fixtures. We prefer a flue and damper where it is possible to make it automatic."

11. "A clever idea used by one builder, is on one side of the fireplace, which is adapted for wood, he has an electric wall outlet, and on the other side a gas plate; making it possible for the tenant to use either wood, gas or electric heater in the fire-place."

12. "Preferred practice is the use of stationary heaters connected with pipe. In most cases fireplaces are not available, and portable heaters are demanded."

13. "My choice of heater for a living room is one of the illuminating flame type, or a gas log. For bedroom, a portable heater of the reflector type; for theatres, stores, offices, warehouses and workrooms my choice would still be the reflector type, if such were well adapted for heating large areas; but I believe gas-steam radiators will occupy less space and give better results."

14. "While we sell a good many steam radiators, we do so because people want them, not because we think much of them."

15. "Where preference is shown for the gas-steam radiator, it is understood that improvements are needed on this type of heater."

16. "The radiator, round type, dead black finish, sells best here."

17. "For the last six purposes I recommend gas-steam radiators. If customer will not pay for these, I recommend the regular gas radiator with flat flame burners. In every case we try to have solid connections."

18. "We have done practically no work in schools, churches, theatres, warehouses or factories. This trade requires a very low price portable heater."

19. "The finish should correspond with the furnishings, etc."

20. "For warehouses, I consider a central plant desirable, pre-

ferably circulating water system. Surface combustion burners should be used. In all types of heaters, more care required to insure correct proportional mixing of gas and air."

21. "The radiant cone type is preferred by our consumers for bed room and living rooms. Tubing is generally used, although we always recommend solid connections. Small round heaters are used in bath rooms. We recommend gas logs for living rooms, parlors and sitting rooms."

22. "If heaters are only used intermittenly, and are odorless, if building code does not require flue, would install none."

23. The union connection for portable heaters is the ideal connection, but is not used to any extent; while slip end connections, although the poorest, have preference over all other methods. I find that heaters connected solid stay in use; while a portable with slip end connection is set away and forgotten. From my experience the automatically controlled gas-steam radiator is the most satisfactory for steady usage, the non-automatic type for intermittent use."

Municipality Buys Coke-Oven Gas.

The *Colliery Guardian* described recently the arrangements of the Middlesborough, England, authorities to buy coke-oven gas as an auxiliary supply to the municipal plant. It is stated that similar arrangements have been reported in Germany, but that this is the first project of its kind in England.

Under the contract with the producers the town of Middlesborough is eventually to take the whole of its gas supply from the firm's Newport works. Such a change, however, must necessarily be gradual, and at present the initial step taken is in the nature of an auxiliary supply to the local gasworks, taken through a 20-inch main about two miles long.

In an experiment of this character it is manifest that several important questions arise. In the first place there is the question of responsibility to the public in the matter of a permanent supply. Hitherto the coke ovens have been practically confined to the production of coke, mainly to fill the specific requirements of local enterprise in the iron and steel industry. The coke-oven has been used primarialy for making gas in some instances, but with rare exceptions, the gas produced in their operation has been regarded as an incidental product that might or might not lend itself to profitable use, according to circumstances. In a case such as that under notice, however, it is obvious that the center of gravity, so to speak, is shifted from the coke to the gas, for it is clear that a primary and imperative condition is that the operation of the ovens must be continuous regardless of the coke market and its fluctuations in demand. This being so the question of storage for surplus coke production necessarily requires consideration, while a still more serious matter may be the disposal of the coke in times of declining demand. This duplication of coke-oven duty—the output of two products for one of which there is a steady public demand, while the disposal of the other is subject to the fluctuations of an uncertain market—may confront coke-oven managers with economic problems that will tax their skill. Nor is the question of storage accommodation confined entirely to the coke. The importance of maintaining the gas supply renders it necessary to provide against industrial risks such as strikes, etc., by the provision of an adequate stock of coal, such as seen at most gasworks. These are points that cannot fail to have an important bearing upon the economic factors involved.

In the case under consideration the commercial elements hold out fair prospects of success. With 200 by-product ovens and 46 Otto regenerative ovens in operation at the Newport works, there should be no question of a failure of the supply. The price to be paid to company is 4d. per 1.000 cubic feet, which, added to the cost of final purification at the gas works (estimated at ¾d. per 1,000) and, say, ½d. per 1,000 for interest, depreciation, etc., makes a total cost of 5¼d., against an average cost of 8d. which has hitherto prevailed at the gasworks. As the public demand is placed at about 580,000,000 cubic feet per annum, it is calculated that when the whole scheme is in operation, there should be a saving of about £7,000 annually, which may go in relief of local rates or to the benefit of the gas consumers.

Another point which should not be overlooked is the effect of this departure in municipal enterprise upon the gas-coke users. Hitherto that small but growing body has been able in most localities to procure a supply of gas coke for domestic or other use, which has assisted materially in the economy in their fuel consumption. The result of an enterprise such as that at Middlesborough must necessarily be a diminution in the supply of such coke, with a consequent probable increase in its price.

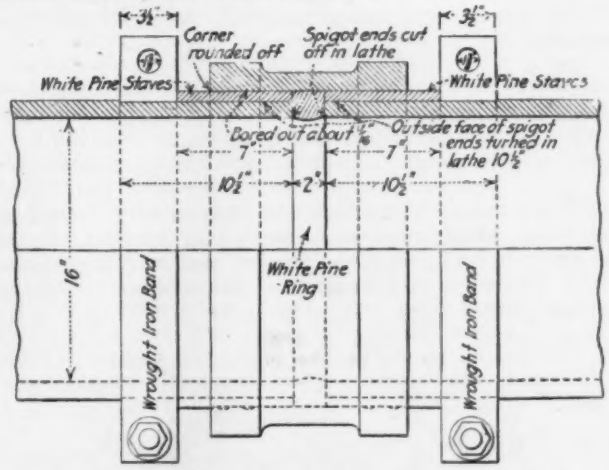
New Methods and Appliances.

SUBSTITUTE FOR GASOLINE.—Remarkable claims are made for a substitute for gasoline recently tested on the Indianapolis speedway. In its report on the tests "Automobile" says:

"The new fuel was employed throughout the test at an average of 50.2 miles per hour, and only one apparently serious trouble was encountered at the end of the first 100 miles, when it was discovered that the fuel was apparently frozen in the vacuum tank where it entered the carbureter. It was necessary to clean the pipe out, a 40-minute stop being required. This trouble was explained as being due to failure to strain the fuel before putting it in the tank. With this exception the fuel gave apparently satisfactory results, although the consumption was rather high, averaging 7.42 miles per gallon. The weather was not satisfactory for a test of this nature, being very cold, the temperature during the first day ranging from 10 to 20° F., and on the second day as low as 6° at the start, rising to 25 late in the afternoon.

"The new fuel gave a hydrometer reading of 55° B., compared with 58° B. for gasoline. The 55° was at 40° F. and at 28° F. the reading was 53° B. The product is described as composed of 25 gallons of water, seven pounds of dry chemicals and one pound of liquid chemicals, naphthaline being one of the fundamental bases. After the test the motor was dismantled in order to note the carbon deposits. The official report made by the representative of the control board of American Automobile Associated, stated that 'the metal parts of the engine are remarkably clean, showing very little more deposits than were found in this same engine at the completion of its one-hour trial on November 12. No deterioration of metal parts due to chemical action was to be observed with the eye.'"

INSULATING JOINT FOR WATER MAINS.—This type of joint has been used by the city of Providence, R. I., since 1907. Five 16-inch joints, three 8-inch, and fifteen 6-inch joints, besides numerous smaller ones on lead service pipes, are giving good service. The joint shown consists of a regular 16-inch sleeve, bored out $\frac{1}{16}$-inch, into which white-pine staves are driven.



The 16-inch joints are on the high pressure fire service mains, and very little trouble from electrolysis is experienced.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,120,905. Meter System. H. Chrisman, Edgewood Park, Pa., assignor to Pittsburgh Meter Co.

1,121,024. Safety Valve for Gas Stoves. L. Knezek, Woodhaven, N. Y.

1,121,105. Diaphragm Valve. G. V. Karlson, Philadelphia, Pa., assignor to American Gasaccumulator Co., same place.

1,121,207. Combination Coal and Gas Stove or Range. M. L. Scanlon, Cleveland, O.

1,121,244. Automatic Gas Analysis Apparatus. C. W. Heath, Cincinnati O.

1,121,276. Control Valve of Gas Burner Operating Mechanism. H. Menzel, Berlin, Germany, assignor to Berlin-Anhaltische Maschinenbau-Aktien-Gesellschaft, same place.

Items of Interest
FROM VARIOUS LOCALITIES.

THE East Ohio Gas Company is placing shut-off markers on houses and other buildings in Canton, O. The markers are of metal painted red with white letters, and state that the shut-off will be found opposite the marker. The City Council started legislation several months ago to compel the gas company to place markers on buildings on account of the difficulty the firemen frequently have in finding the gas shut-off. The ordinance was dropped but the gas company is carrying out the request of the city.

MR. J. P. SMITH, Vice-President of the New Ulm (Minn.) Gas Company, is engaged in promoting the organization of a company to build a central gas plant for the Mesaba range, in the vicinity of the city of Virginia. He has succeeded in interesting a number of prominent people in different range towns in his project and expects to secure the necessary franchises to make the plant a success.

AN unusual accident is reported from Texas, in which an employee of a gas and electric company was scalded severely by steam when he fell from a ladder against a large steam pipe at one of the gas holders. He was standing on a 12-foot ladder, which suddenly gave way, and in falling he struck the steam pipe, the connection of which burst, allowing the scalding steam to pour out over him. He was burned principally on the legs and hips.

THE Judge of a Massachusetts district court took a determined stand against the "quarter meter" in juvenile court recently, as the result of a boy's appearance on a charge of breaking one open. In no uncertain terms the Judge declared such meters to be not only a temptation to boys, but a danger to life and health as well. This opinion was drawn out as a result of the protest by an official of the local gas company against the habit of boys breaking the meters open. The official requested that punishment in such case be made severe because of the danger to residents of the building, declaring that in nine cases out of ten the supply pipe is damaged when the money box is broken into, thus endangering life, either by asphyxiation, fire or explosion. The Judge answered that if such is the case it might be well to abolish the use of quarter meters altogether.

LAST week the tank bottom of the new 210 foot diameter holder being built by the Cambrihge (Mass.) Gas Light Company, was lowered onto the foundation. The completed holder will have four lifts, and storage capacity of about 4,000,000 cubic feet of gas.

THE Committe of the Bismarck, N. Dakota, City Council has reported the proposed franchise and submitted it with a few changes to the city attorney, with the request that he communicate with Mr. F. E. Ployhar as to the plans he intends to use in the construction of the plant.

MR. SAMUEL T. BODINE, President of the United Gas Improvement Company, has been elected a Director of the Cambria Steel Company.

THEY are not always as considerate as the Galena, Ills., "Gazette," which says: "The "Gazette" was again handicapped considerably in setting up matter for to-day's issue by not having linotype service from 10:30 until about 3:45 this afternoon, as the gas supply was shut off during that time, the workmen at the plant were making repairs to the purifier. But at 3 o'clock a good pressure had been turned on. It is a hard proposition to furnish gas to all the consumers all of the time with the crippled works, and Galena people are praising the efforts of the management for the exceptionally good service under the trying conditions."

MR. D. F. BURRITT, general superintendent of the National Gas, Electric Light and Power Company, which controls the Quincy, (Ill.) Gas, Electric and Heating Company, has just been in Quincy on his annual visit.

"D," WRITES that gas stoves are being installed in many homes in Virginia, (Minn.) in anticipation of starting the municipal gas plant by Christmas day. The stoves have been shipped in here by the car load, and hardware men are doing a land-office business. Plumbers are up to their necks in work making connections.

NO announcement has been made of the action of the Public Service Gas Company as a result of the decision of the Court of Errors and Appeals setting aside the order of the Public Utilities Board fixing ninety cents per 1,000 as a price of gas. The directors of both the Gas Company and the Public Service Corporation held meetings, and afterward President McCarter said: "The directors discussed the application of the Court's decision and left the matter in my hands. There is nothing to be said at present because I feel that courtesy dictates that the matter should be taken up with the Utility Commissioners before any formal statement is made."

EAST GREENWICH, R. I., is being canvassed to ascertain how many residents will take gas if the Providence Gas Gompany extends its service to that town.

ROCKY MOUNT'S new gas plant, the only municipally-owned plant of the kind in North Carolina, was put into full operation last week, after some 8 months construction work. The plant is finished in every detail, and gas is being made every day, though there remains yet about 1 mile of mains to be laid in one section of the city.

BUSINESS in Cherokee City, Ia., has grown so much that the Cherokee Gas Company has had to order a larger water gas set. Mr. H. E. Bennett, manager of the company is credited with having pushed the business to a point where a new gas machine is necessary.

MANAGER REED, of the Duluth (Minn.) Gas department, says that the improvements made to the city's gas system has enabled the department to reduce the pressure from 74 inches to 48 inches, and resulted in giving better service as well as in reducing the cost of distribution. Probably the biggest improvement was the replacement this Fall of the 6-inch main on London Road, between 14th and 19th avenues, with a 10-inch main. The mains on both ends of these five blocks were larger, and it made necessary a much higher pressure to force enough gas ahead to supply the eastern sections of the city. Another change which is expected to improve the service in the downtown section is the proposed connecting of the old Prindle main in Michigan street with the high pressure mains. The present main will be transformed into a low pressure main and the Prindle main into a high pressure main. The present main will continue to supply customers as at present, and the Prindle main, connected with the high pressure main in First alley at First avenue east, will increase the gas supply for the downtown section and the eastern suburbs.

THE Milwaukee (Wis.) Gas Light Company is conducting a series of free cooking demonstrations and lectures in its salesroom in the Gas Appliance Building, Wisconsin and Jackson streets. The demonstrations begin at 3 o'clock each afternoon and continue to 5:30. Miss Caroline E. Martin, a graduate of Pratt Institute, and now director of the Y. W. C. A. cafeteria, is conducting the work.

THE Boyertown, Pa., "Democrat" says: "Birdsboro is to get dollar gas after New Year. Boyertown has been paying a dollar and a half for gas ever since we had gas, and never much kick made. Maybe, because we haven't kicked, and because we have given the gas company a chance to get a good financial start by paying a dollar and a half for a dollar article all these years, the company will one of these days give us the dollar gas without a kick—maybe."

A REPRESENTATIVE of an Ogdensburg (N. Y.) company has been endeavoring to create sentiment for establishing a plant in Norwood to furnish gas for heating and lighting. Many residents have expressed a desire for gas, and the matter will be brought before the citizens in the near future.

LAST week at Marie Hall in Malden, Mass., was held a gathering of the gas club, composed of employees of the Malden and Melrose Gas Company. Covers were set for 135; it being the annual Christmas party. Supt. C. E. Paige told of his trip to Minneapolis after the supper. A social time with dancing followed.

IT is reported that a large piece of the old Phillips farm in Marblehead, Mass., has been purchased by the Lynn Gas and Electric Company, and that they are to erect on it a large gas holder,

THE old Antigo (Wis.) Gas Company has again been brought into the limelight by Edgar Neff starting an action against members of the company to recover losses alleged to have come from its bankruptcy. Summons were served upon R. H. Hacket, of Oshkosh,

William Wallen of Oshkosh, Richard Koebke and Mrs. Richard Koebke of Antigo. Mr. Hacket was the vice-president of the old company and Wallen its secretary.

THE Public Lighting Committee of the Minneapolis City Council has asked the aldermen to acquire the ornamental gas street lamps installed along Kenwood Parkway between Hennepin avenue and the Armory for the National Commercial Gas Show. The equipment was installed at a cost of nearly $1,500 and can be bought now for $638. The Minneapolis Automobile Trade Association offers to pay $138 of the cost, giving the lamps to the city for $500. Alderman Walker moved to buy the lamps when it was reported that there would be sufficient money in the lighting fund to pay for them.

MR. H. THURSTON OWENS, until recently Secretary and General Manager of the San Diego (Cal.) Gas and Electric Appliance Company, has become associated with the lighting fixture house of Bayley & Sons. with headquarters at 101 Park avenue, New York city. Mr. Owens has been in the lighting business for 15 years, having been with the Consolidated Gas Company, the city of New York, the AMERICAN GAS LIGHT JOURNAL, and General Manager of the La Crosse (Wis.) Gas and Electric Company. He has been actively identified with the work of a number of gas and electric associations and a frequent contributor to the trade papers.

LIKE Thomas A. Edison, who built his own carbolic acid plant when the German source of supply was cut off by the war, the Lindsay Light Company of Chicago announces that it now has a thorium plant in operation, and in addition to making from monazite sand the thorium for its mantles, will manufacture mesothorium, a radio-active substance used in medical science as a substitute for radium in the treatment of cancer.

MR. MYER J. STEIN, an attorney living in Oak Park, Ills., has filed a complaint with the Public Utilities Commission asking revocation of the charter of the Public Service Company of Northern Illinois. Mr. Stein asks the commission to join him in the institution of quo warranto proceedings against the company, charging that it is violating its charter in selling merchandise in addition to gas and electricity. The petition also charges the company with blackmail, extortion, oppression and persecution. The supply of gas and electricity was cut off from Mr. Stein's house when the payment on an electric washing machine was overdue. Mr. Stein stated that his gas and electric light bills were fully paid up, and asserts that the company is going beyond its rights in cutting off his supply of light and heat because of an unpaid merchandise bill.

THE Providence (R. I.) Gas Company has made a 2-year contract with the Gulf Refining Company, which is building a receiving plant on the east side of the harbor, for 8,000,000 gallons of crude oil; and the first shipload is now being pumped from a vessel at the gas company's dock. The contract with the gas company insures at least two ships a month. This corporation is a competitor of the Standard Oil Company, and owns a large fleet of tank vessels, sailing under the American flag. Ground has been broken on the Lyons Farm, in East Providence, for the erection of the receiving tanks and a spur track will soon be laid there. Later the docks will be built.

Mr. GEORGE S. PATCHEL, of Cape May, N. J., is in charge at the plant of the Canon Gas Company, Canon City, Colo. He is an expert gas maker and the gas company acquired his services in keeping with their ambition to give the people the best possible service.

THE Commissioner of Gas and Electricity of Chicago, Ills., has asked for bids for furnishing the city with lights on certain parts of streets in different sections of the city for one year from Jan. 1, 1915. in the following approximate quantities:

9,500 Incandescent Gas Lamps.
500 Ornamental Incandescent Gas Lamps.
5,000 Incandescent Gasolene Lamps.

To protect its river bank plant in South Minneapolis, Minn., from encroachments the Minneapolis Gas Light Company has paid $35,000 for property adjoining the gas holder lot. The property is on the river bank and was part of an estate which was about to be sold. President A. T. Rand says that the company has no plans for development of the tract, but purchased it to provide for possible future needs

Utilities Commission News.

GENESEO, N. Y., GAS SUPPLY.—Briefs have been filed with the Up-State New York Commission upon the question whether Geneseo will have the present artificial gas service substituted by natural gas. In the present contest Geneseo's Board of Trustees and a majority of the residents are arrayed in favor of natural gas, which under the franchise granted the Pavilion Natural Gas Company by the board would cost in the neighborhood of 45 cents per 1,000 feet, while opposed to this invasion of their field is the Geneseo Gas Light Co., disputing the way and basing its contentions on two grounds, one that the Pavilion company would not be equal to the task of supplying enough gas, and the other that such an invasion would spell ruin to the local company. The chief complaint against the local company is that it has charged $2 per 1,000 and has extended its pipes but little beyond the business section, leaving many of the principal streets without gas.

CONFERENCE ON NEW JERSEY RATE SITUATION.—Mr. Thomas N. McCarter, President of the Public Service Corporation, and its subsidiary companies, has communicated with Alfred N. Barber, Secretary of the State Board of Public Utilities Commissioners, asking that a date be fixed for a conference with that body over the recent decision of the Court of Errors and Appeals, which made it possible for the Public Service Gas Company to return to its old rate of $1 per 1,000 cubic feet for gas. The rate now charged, under the order and recommendations of the Utilities Commission, is 90 cents.

BROOKLYN, N. Y., VALUATIONS.—Commissioner Maltbie, First District, New York, has resumed the investigation into the value of the property of the Jamaica, Woodhaven and Richmond Hill gas companies, with a view to the reduction of the price of gas to 80 cents to consumers in the Fifth Ward of Queens, in accordance with a petition presented some time ago. The present rate is $1, which is called excessive by the consumers. These three companies are the property of the Brooklyn Union Gas Company, having been acquired by it in 1897.

PORTLAND, O., FRANCHISE.—If officials of the Portland Gas and Coke Company are satisfied with the franchises under which the company is now operating the public should be satisfied because their interests are protected fully, is the substance of a report to the City Council by City Commissioner Daly and City Attorney LaRoche, following an investigation asked by Governor West in accordance with a resolution passed by the State Legislature.

It was contended that the company's franchises were granted by the Legislature and that possibly the interests either of the company or the public were not properly safeguarded and that the company should be placed on the same footing as other Portland public service corporations by being given a municipal franchise in lieu of the franchise granted by the Legislature.

"If any abuse on the part of the company exists," reads the report. "it can be corrected effectually by the Legislature or the State Railroad Commission. The Legislature has the power to change or repeal the franchise if the company violates any of the provisions."

It is the general tenor of the report that the proposition of a municipal franchise should be dropped. The only changes that could be made in a franchise given by the city would be the limiting of the franchise to 25 years and the changing of the compensation for the franchise rights.

BROCKTON AND STOUGHTON, MASS.—The Brockton (Mass.) Gas Light Co.. has filed a petition with the state board of gas and electric light commissioners to extend its service into the town of Stoughton. Because the commission has before it a petition for the increase of its capital stock. the company requests an early date for hearing, and that the two hearings be held jointly.

Delay in securing a hearing seems evident from the fact a vacancy in the board exists by reason of the recent death of the chairman, Forrest E. Barker of Worcester.

The petition of the company is in line with the plans of the Stoughton board of trade to have the gas light company take over the gas plant now maintained in that town by the Edison Electric Illuminating Company of Brockton. The Brockton company has applied for permission to lay pipes in Stoughton.

MUST IMPROVE SERVICE.—The Board of Public Utility Commissioners has decided that the Newton (N. J.) Gas and Electric Company does not furnish safe and adequate service or keep its property and equipment in such condition as to enable it to do so.

Financial Notes.

PROCEEDS of the $1,200,000 first mortgage 5's of OHIO LIGHT AND POWER COMPANY, a subsidiary of American Gas and Electric Company, will be used in the erection of transmission lines connecting the company's various properties into two main operating groups. By this it is expected that a number of operating economies will be effected, resulting in increased net earnings. The company operates in 11 municipalities in Ohio, serving a population of 100,000, doing the entire commercial electric light and power business in all the cities and the street lighting in all but one. In the year ended Oct. 31, gross earnings were $421,145, and operating expenses and taxes were $299,718, leaving net earnings of $121,427.

THE ATLANTIC CITY (N. J.) GAS COMPANY has filed with the Board of Tax Equalization a request for a reduction of more than $1,000,000 in its tax assessment.

THE CALIFORNIA RAILWAY AND POWER COMPANY, which controls the United Railroads of San Francisco, the Sierra and San Francisco Power Company, and the Coast Valleys Gas and Electric Company, has just issued its first report for the year ended June 30, 1914. The company is entirely free from funded and floating debt, and has assets of $49,941,196, of which $47,739,469 comprises the controlling interest in the stocks of its subsidiary public service companies. The company is paying dividends of 7 per cent. on $2,900,000 prior preference stock, and during the fiscal year paid dividends aggregating 5½ per cent. on $6,874,400 preferred stock, and retired $100,000 par value of prior preference stock.

THE MASSACHUSETTS GAS COMPANIES is making a semi-annual interest payment on $5,518,000 4½ per cent. bonds, calling for $124,155.

SEA ISLAND CITY, N. J., may have a municipal gas works. The plant of the Standard Gas Company, which supplies that resort, will be sold to the highest bidder at a receiver's sale on December 29th, and the city solicitor has been instructed by the commissioners to ascertain what steps will be necessary to provide the funds for its purchase.

THE recent selling of OGDEN GAS first mortgage 5 per cent bonds is traceable to certain large owners of the issue in England. These bonds are the only Chicago Stock Exchange security in which foreign liquidation has been a factor of any importance. The result is that Ogden Gas 5s are somewhat lower, as compared with its closing price July 30, than are other Chicago utility bonds. A recent sale of $10,000 of these bonds at 92 is 3½ under the July 30 level, while People's Gas refunding 5s at 99⅞ are only ⅛ under the close of that date.

ON August 15 the PACIFIC GAS AND ELECTRIC COMPANY announced the sale of $8,750,000 par value of the new issue of first preferred 6 per cent. stock. The following table just issued shows the distribution:

	Number of Subscribers.	Par value of shares.
Employees	1,621	$548,600
Customers	1,162	1,325,600
Stockholders, etc	712	6,875,800
Totals	3,495	$8,750,000

The participation of employees and consumers of the company is particularly noteworthy. About 40 per cent of its permanent staff have become shareholders. The company has outstanding about $51,000,000 par value of stock, including its common, junior preferred and first preferred. As shown in the following statement, almost one-half of this stock is owned on the Pacific Coast. The distribution of the company's stock along geographical lines is as follows:

	No. Holders	Shares.	Par Value.
Pacific Coast	3,976	234,751	$23,475,100
Middle West	768	65,874	6,587,400
Eastern Coast	665	165,459	16,545,900
Europe	383	42,509	4,250,900
Totals	5,792	508,593	$50,859,300

The women stockholders aggregate 1,428, owning 52,132 shares; the bondholders total about 12,500 individuals and institutions, and the combined total of security holders of all kinds 18,292.

THE SPRINGFIELD (MASS.) GAS LIGHT COMPANY has purchased the South Hadley Gas Company, acquiring the stock at a price said to be in the neighborhood of $45 per share.

THE CITIZENS' GAS COMPANY of Salisbury, Md., has asked permission of the Public Service Commission to issue stocks and bonds to purchase the plant and franchise of the Home Gas Company of Salisbury. The petition asks authority to issue $120,000 bonds and $60,000 in stock to effect the purchase and $5,000 additional stock to make immediate improvements.

LETTERS have been sent to the thousands of local stockholders of the CINCINNATI (O.) GAS AND ELECTRIC COMPANY by the recently formed Stockholders' Committee, of which Alfred M. Cohan is Chairman, urging them to unite in looking after the company's interest. The letter says: "The company has pending before the City Council an application for a renewal of its rates for supplying electricity. A well defined and powerful propaganda seeks to impose unfair rates on the company with the ultimate end of destroying a large part of the company's property."

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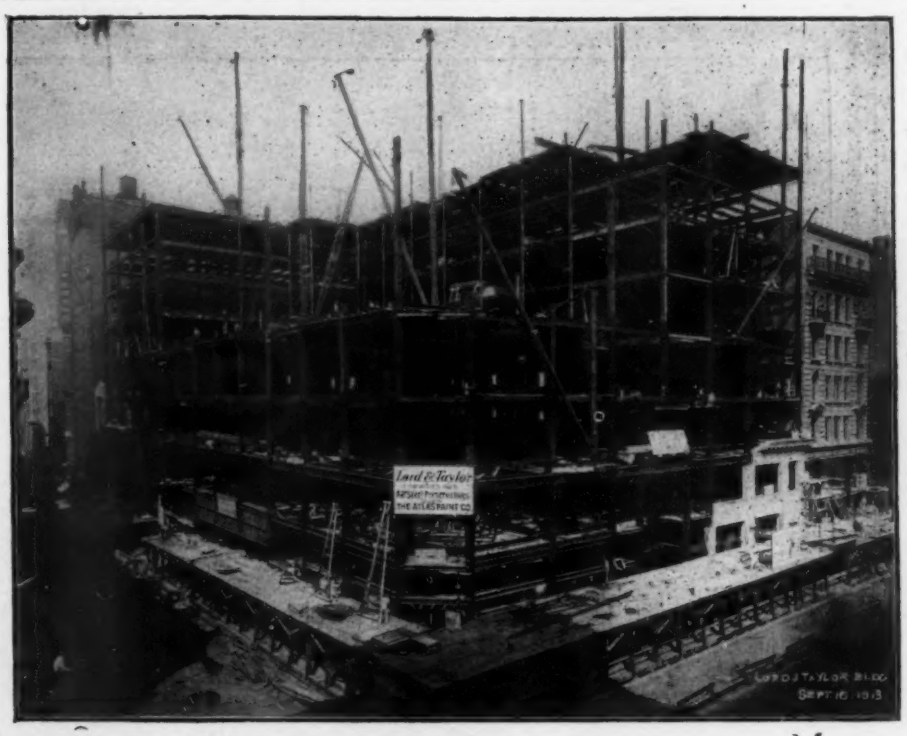

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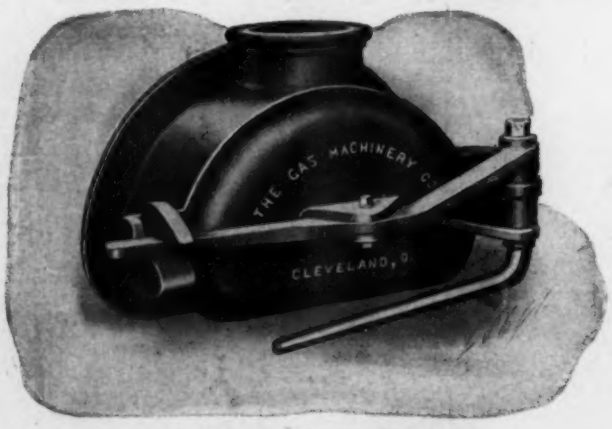

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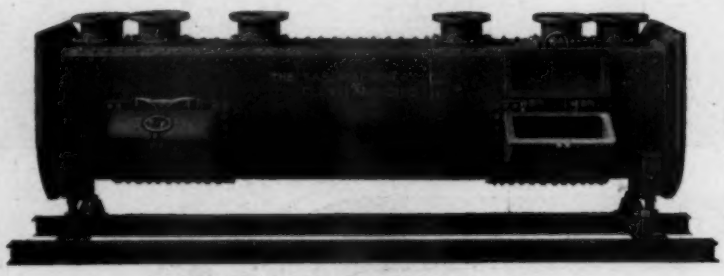

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TOKIO	1¾ "
LURGAN	¼ "
HELENSBURGH	½ "
SYDNEY, N. S. W	1¾ "
BRADFORD	2 "
FITCHBURG, U. S. A	¼ "
NEWCASTLE, N. S. W	1 "
BELFAST	2½ "
NELSON	1¼ "
BLACKPOOL	¾ "
STOCKHOLM (Sweden)	1½ "
BERGEN (Norway)	¾ "
NEWCASTLE-UPON-TYNE	2½ "
HEYWOOD	½ "
DARLINGTON	2 "
OLDHAM	2 "
BRIDGWATER	½ "
SOUTHPORT	1¼ "
CAMBUSLANG	½ "
NOTTINGHAM	2½ "
TIPTON	1¼ "
LEICESTER	4 "
EXETER	½ "
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BERLIN (Germany)	¼ "
LIVERPOOL	2½ "
MACCLESFIELD	1 "
LYTHAM	½ "
SYDNEY, N.S.W. (3d Installat'n)	6 "
DUNOON	⅜ "
PAWTUCKET, U. S. A	1 "
MONTREAL (Canada)	4 "
OTTAWA (Canada)	1½ "
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BANGOR (Ireland)	⅜ "
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CARDIFF	2½ "
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BELFAST (2d Installation)	5½ "
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SPRINGFIELD, U. S. A	1½ "
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LIVERPOOL (2d Installation)	2½ "
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PORTLAND, U. S. A	1 "
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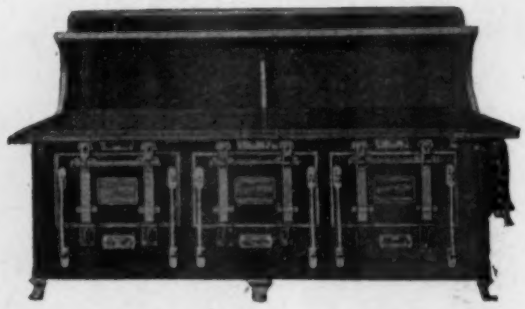

¶ The success of the Eclipse Hot Blast is due in a large measure to the fact that the entire cooking top and all ovens are heated by a single set of four burners. While this feature alone places this range far in advance of all others, there are still other features which are considered by those who have used this range as being almost as important as the reduced number of burners.

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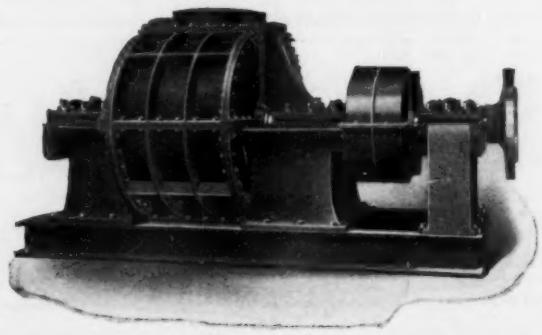

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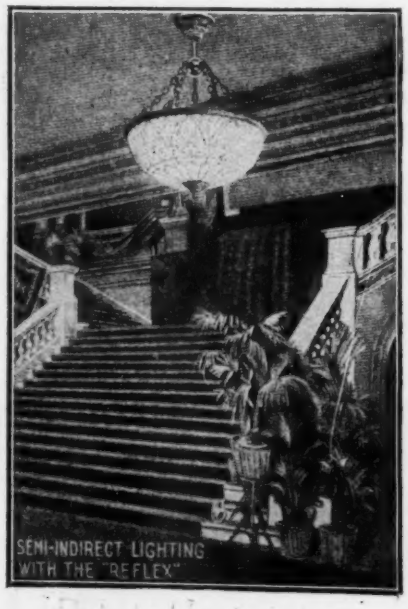

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PUBLIC LIGHTING TABLE FOR JULY, 1914.

COMMUNICATED BY THE AMERICAN METER COMPANY.

Day of Week.	MOONLIGHT SCHEDULE.		
	Date.	Light.	Extinguish.
Wednesday	1	11.10 P.M.	3.30 A.M.
Thursday	2	11.40	3.30
Friday	3	12.20 A.M.	3.30
Saturday	4	1.10	3.30
Sunday	5	2.10	3.30
Monday	6	No L.	No L.
Tuesday	7	No L. F.M.	No L.
Wednesday	8	No L.	No L.
Thursday	9	8.00 P.M.	10.20 P.M.
Friday	10	8.00	10.40
Saturday	11	8.00	11.00
Sunday	12	8.00	11.20
Monday	13	8.00	11 40
Tuesday	14	8.00 L.Q.	12.00
Wednesday	15	8.00	12 20 A.M.
Thursday	16	8.00	12.50
Friday	17	8.00	1 20
Saturday	18	8.00	2.00
Sunday	19	7.50	3.50
Monday	20	7.50	3.50
Tuesday	21	7.50	3.50
Wednesday	22	7.50 N.M.	3.50
Thursday	23	7.50	3.50
Friday	24	7.50	3.50
Saturday	25	7.50	3.50
Sunday	26	7.50	3.50
Monday	27	8.50	3.50
Tuesday	28	9.10	3.50
Wednesday	29	9.40 F.Q.	3.50
Thursday	30	10.20	3.50
Friday	31	11.00	3.50

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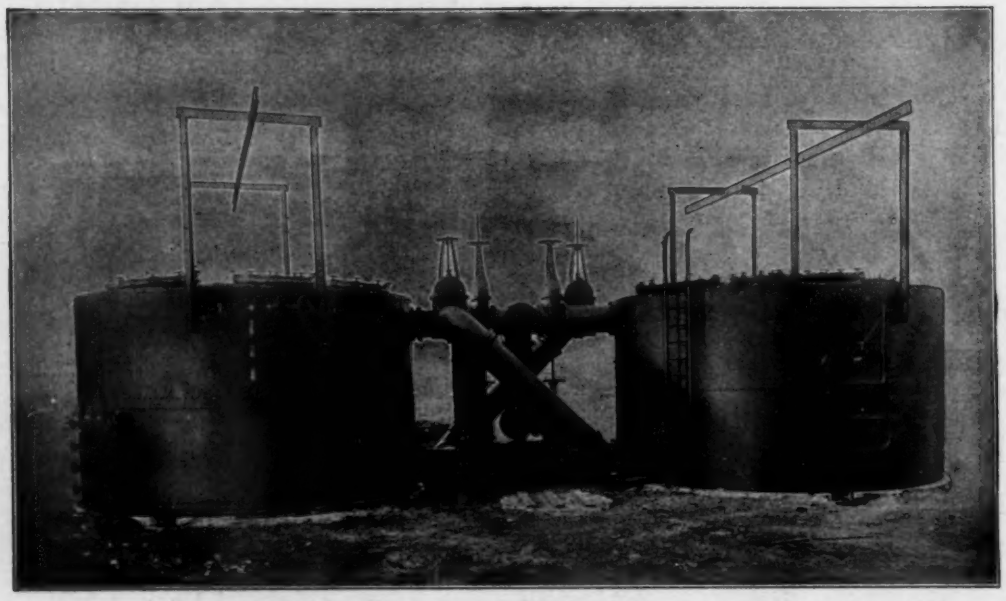

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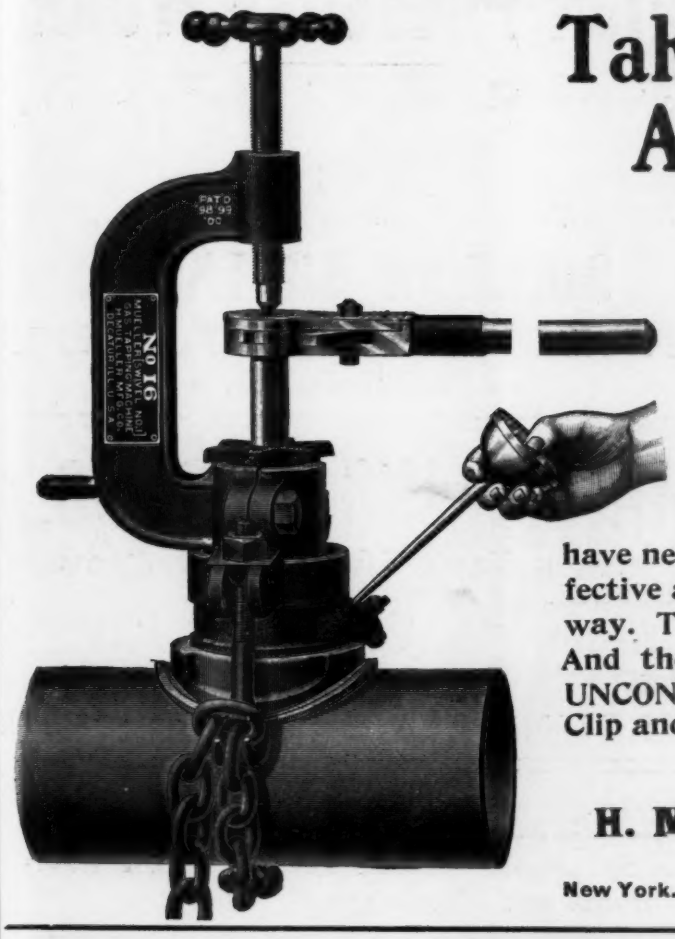

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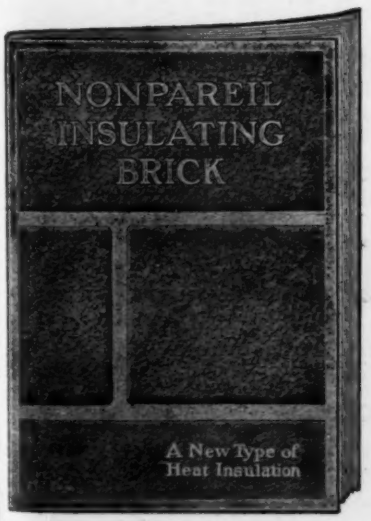

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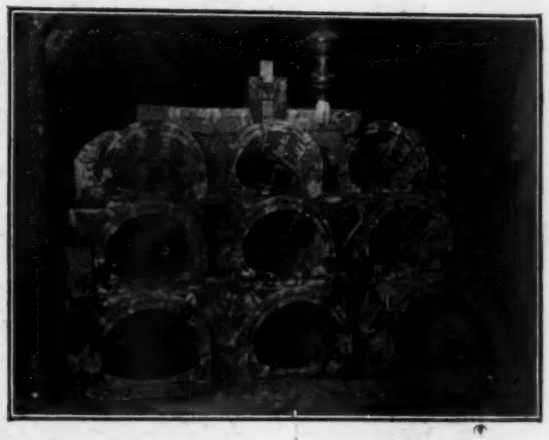

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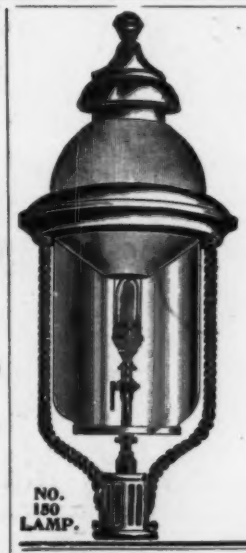

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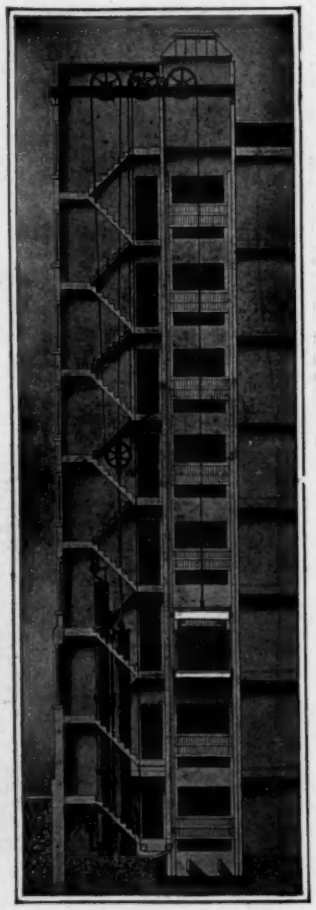

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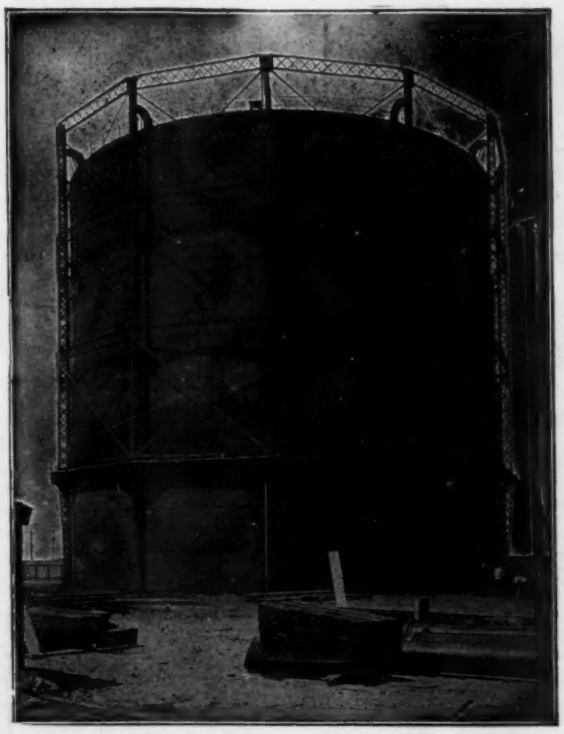

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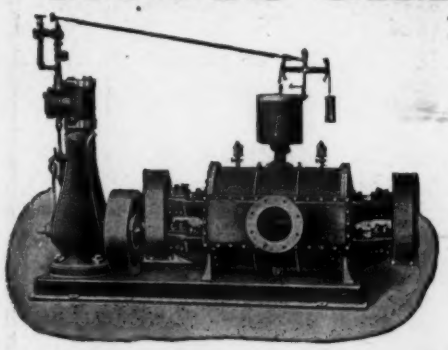

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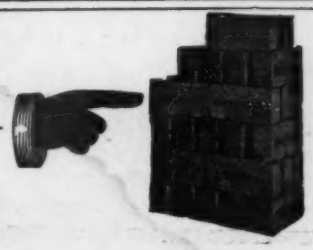

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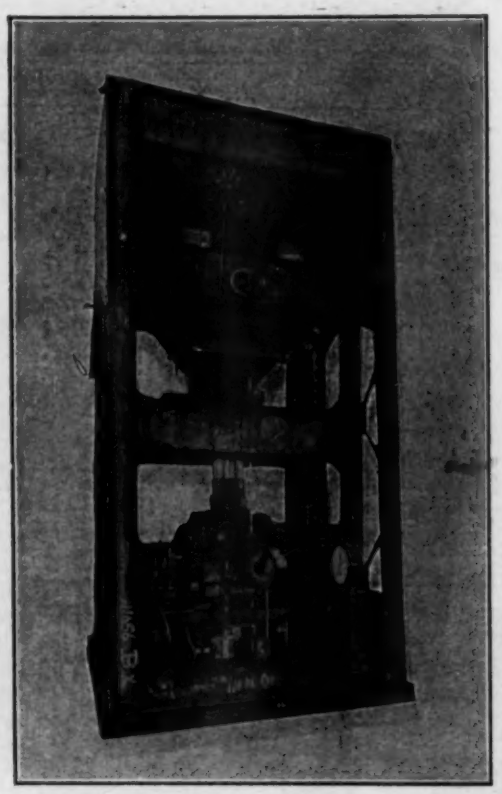

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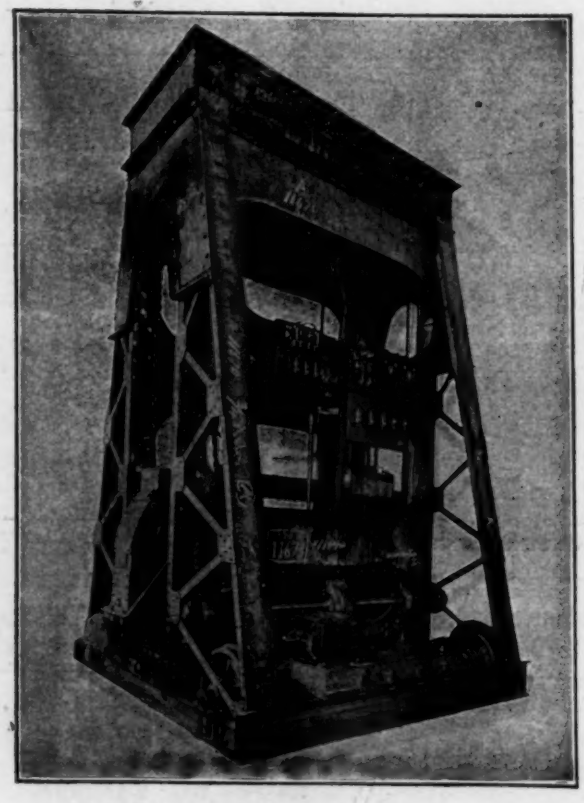

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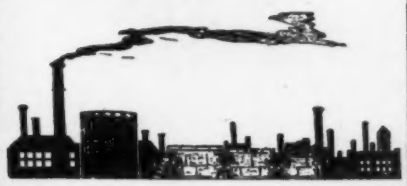

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American Gas Institute.—Annual meeting, New York, October 21, 23, 1914. Officers: President, W. H. Gartley, Philadelphia. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting, Ottawa, Ont., Sept. 3, 4, 1914. Officers: President, A. A. Dion, Ottawa; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct., 1914. Officers: President, J. T. Hutchings, Bochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meters.—Monthly Section Meetings; Grand Commissioner, Will. W. Barnes, East Orange, N. J.; Gen'l Sec'y, Thurston Owens, San Diego, Cal.; New York Section Chairman, W. H. Pettes; Secretary, G. E. Smith, Sipp Avenue, Jersey City, N. J. Cleveland Section, Chairman, C. W. Downing; Secretary-Treasurer, W. H. Holtz, East Ohio Gas Co. Philadelphia Section; Chairman, Stanley Grady; Secretary, H. E. Stiteler, Broad and Arch streets. New England Section, Chairman, C. E. Lasker, Pawtucket, R. I.; Sec., A. F. Pettingill, Cambridge, Mass. Bethlehem Section, Trueman Weithnecht, Chairman; Sec.-Treas., Truman Buss, South Bethlehem, Pa. Wisconsin Section, C. H. Wiggers, Chairman; P. Hoffman, Secretary, Milwaukee, Wis.

Guild of Gas Managers of New England.—Annual meeting, March, 1915. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, J. A. Gould, Boston; Vice-President, N. W. Gerrard, East Boston; Treasurer, W. F. Norton, Nashua, N. H.; Secretary, H. K. Morrison, Lynn.

Illinois Gas Association.—Annual meeting, March, 1915. Chicago, Ills. Officers: President, L. H. Johnson, Aurora, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting, Cleveland, O., September, 1914. Meetings of Sections, monthly. Pres., Charles O. Bond; General Secretary, J. D Israel, 1000 Chestnut st., Philadelphia, Pa. Sections: New York, Secretary, C. L. Law, 124 West 42d street; Managers, G. W. Cassidy, Norman D. Macdonald, H. B. McLean, F. E. Wallis and P. S. Young; Chairman, N. Macbeth. New England, Secretary, S. C. Rogers; Managers, C. M. Coles, J. W. Cowles, W. B. Loncaster, H. F. Wallace and R. C. Ware; Chairman, L. Bell. Philadelphia, Secretary, L. B. Eichengreen, Counties Gas & Elec. Co., Ardmore, Pa. Secretary, J. B. Jackson, 28 North Market street. Chicago Secretary, H. B. Wheeler; Managers, H. S. Gradle, M. G. Lloyd, F. A. Pinckney, E. G. Pratt and H. V. Willman; Chairman, W. A. Durgin, Pittsburgh. Secretary, S. G. Hibben; Managers, W. A. Donkin, H. T. Hower, H. Kirschberg, E. B. Rowe and R. H. Skinner; Chairman, G. W. Roosa.

Indiana Gas Association.—Annual meeting, March 10 and 11, 1915. Terre Haute. Officers: President, A. C. Blinn, Evansville; secretary-Treasurer, J. W. Dunbar, New Albany.

Iowa District Gas Association.—Annual meeting, Dubuque, Ia., May ——, 1915 Officers: President, Thos. Crawford, Clinton, Ia; Secretary, T. B. Genay, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October—— 1914. Arkansas City. Officers: President, Al. Newman, Arkansas City; Secretary and Treasurer, Ivan Thomas, Wichita Kas.

Michigan Gas Association—Annual meeting, September, 1914. Place, undetermined. Officers President, H. W. Douglas, Ann Arbor, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Public Service Association.—Annual meeting, May ——————, 1916 Officers: President, A. C. Einstein, St, Louis, Mo; Secretary and Treasurer, F. D. Beardsley, St. Louis, Mo.

Montana Gas Association.—Annual Meeting, Helena, Mont., February, 1815. President, G. A. Strain, Helena Mont.; Secretary, I. C. Covert, Billings, Mont.

National Commercial Gas Association.—Annual meeting, Dec. ——1914, Minneapolis, Minn. Officers: President, P. S. Young, Newark, N. J.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cincinnati, O., May 16, 17, 18, 1915; Officers: President, J. T. Lynn, Detroit, Mich; Secy-Treas., T. Clive Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, 1915. Boston. Officers: President, C. A. Learned, Meridan, Conn.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Next Meeting, Aug. ——, 1914, Asbury Park N. J. President, C. F. Butcher, Freehold, N. J.; Sec'y-Treasurer, O. F. Potter, Newark, N. J.

Ohio Gas Association.—Annual meeting, February ——— 1915, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, Oklahoma City May, ——1914. President, F. R. Bowman, Ada; Secretary-Treasurer, H. V. Boze, Oklahoma City.

Pacific Coast Gas Association.—Annual meeting, Long Beach, Cal., September 15, 16, 17 18, 1914. Officers: President, C. S. Vance, Los Angeles, Cal.; Secretary-Treasurer, Henry Bostwick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Allentown, Pa., April ——— 1915; Officers, President, L. R. Dutton, Wyncote, Pa.; secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 1914; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city.

Southern Gas Association.—Annual meeting, Mobile, Ala., April ———, 1915, Officers President, S. E. DeFreese, Chattanooga, Tenn; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting, May ————'915, Galveston, Tex. Officers: President, D. G. Fisher, Dallas, Tex.; Secretary, H. S. Cooper, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 13 and 14, 1915 Milwaukee, Wis. Officers: President, J. N. Walker, Milwaukee, Wis.; Secretary-Treasurer, Henr Harman, Milwaukee, Wis.

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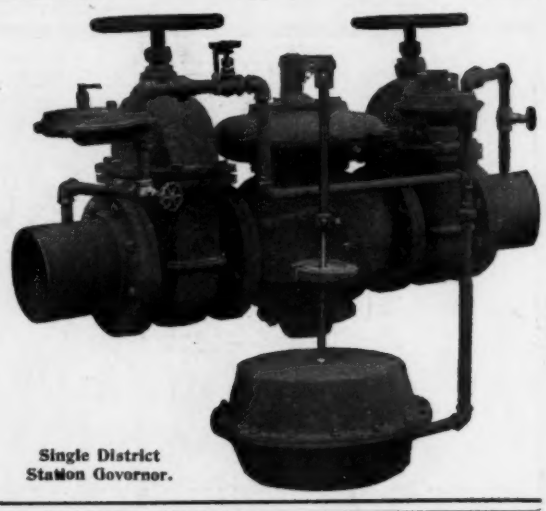

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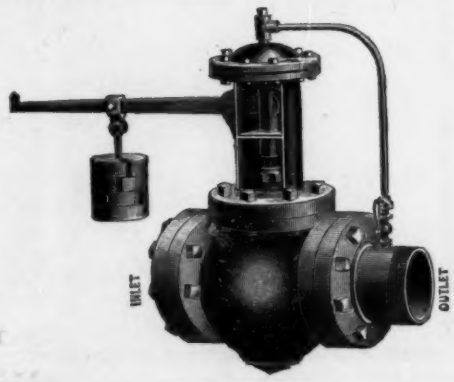

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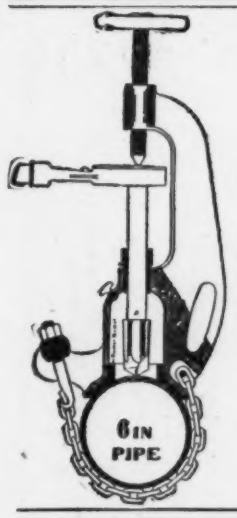

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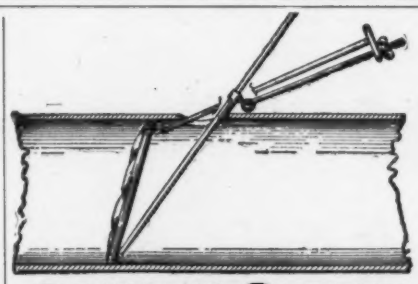

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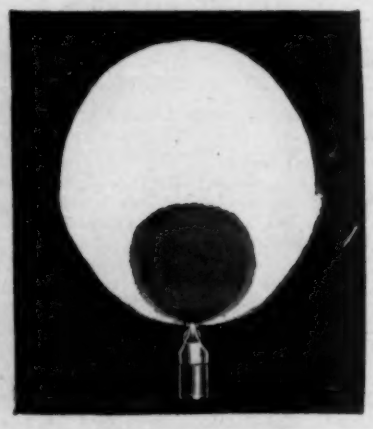

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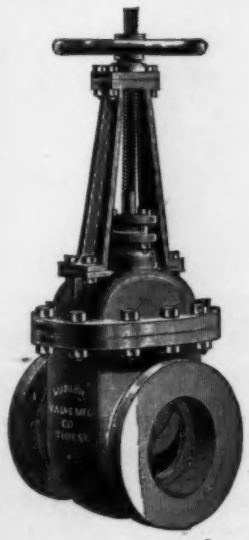

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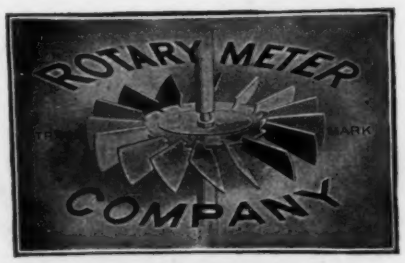

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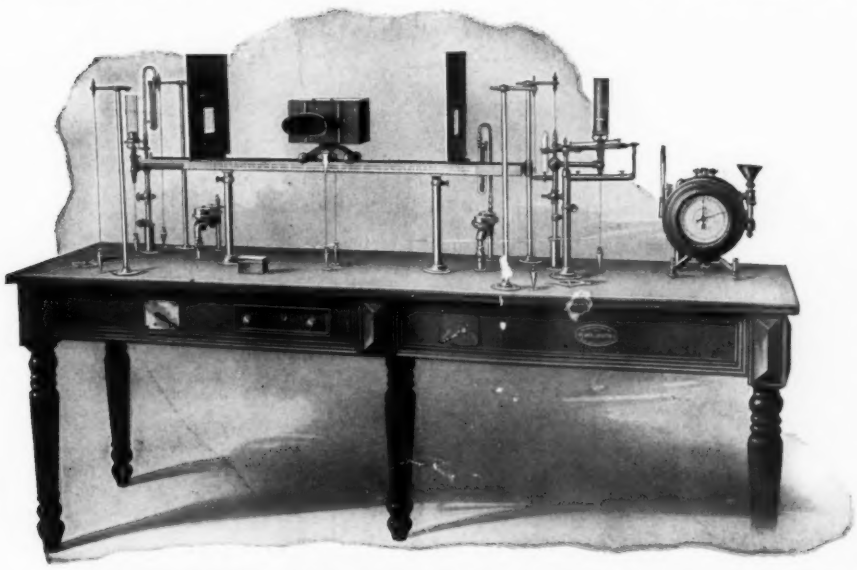

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